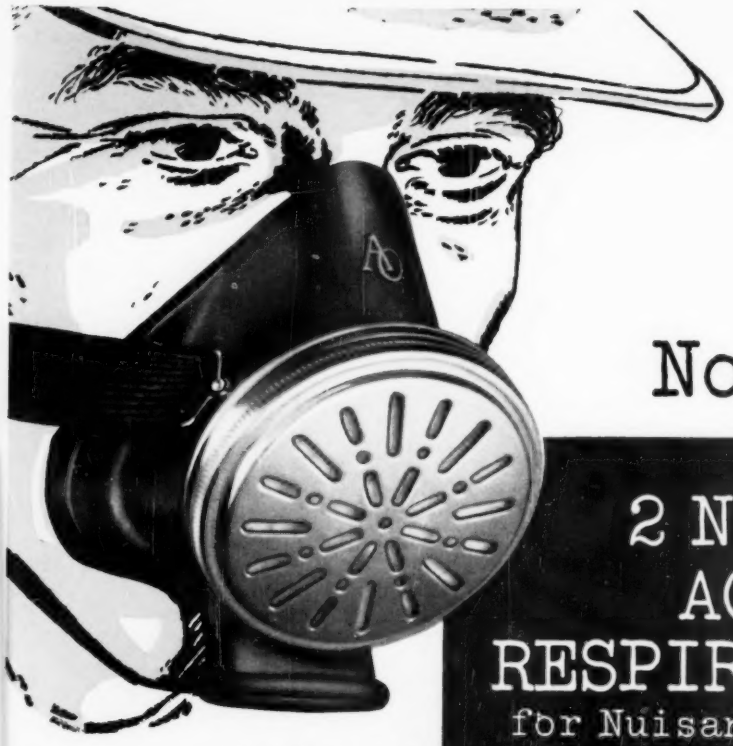
# SAFETY ENGINEERING

*See page 12 for the first article of the new Safe Flooring Series.*

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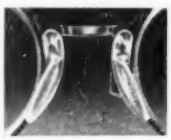

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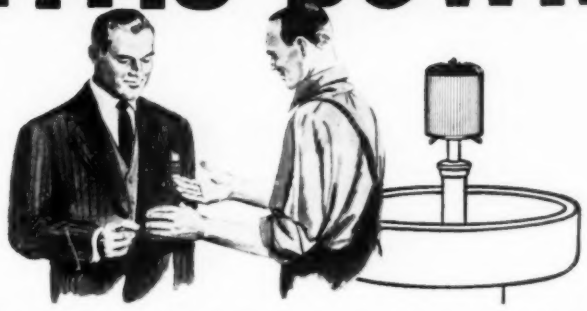
# DERMATITIS DOWN



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# SAFETY ENGINEERING

## *The Magazine of Safety*

Reg. U. S. Pat. Off.

**A MONTHLY PUBLICATION DEDICATED TO ACCIDENT PREVENTION, HEALTH CONSERVATION AND FIRE CONTROL.**
**EST. 1901**

**VOL. 97, NO. 1** **1949**
**JANUARY** **BEST'S 50TH ANNIVERSARY YEAR**

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PICTURE CREDITS
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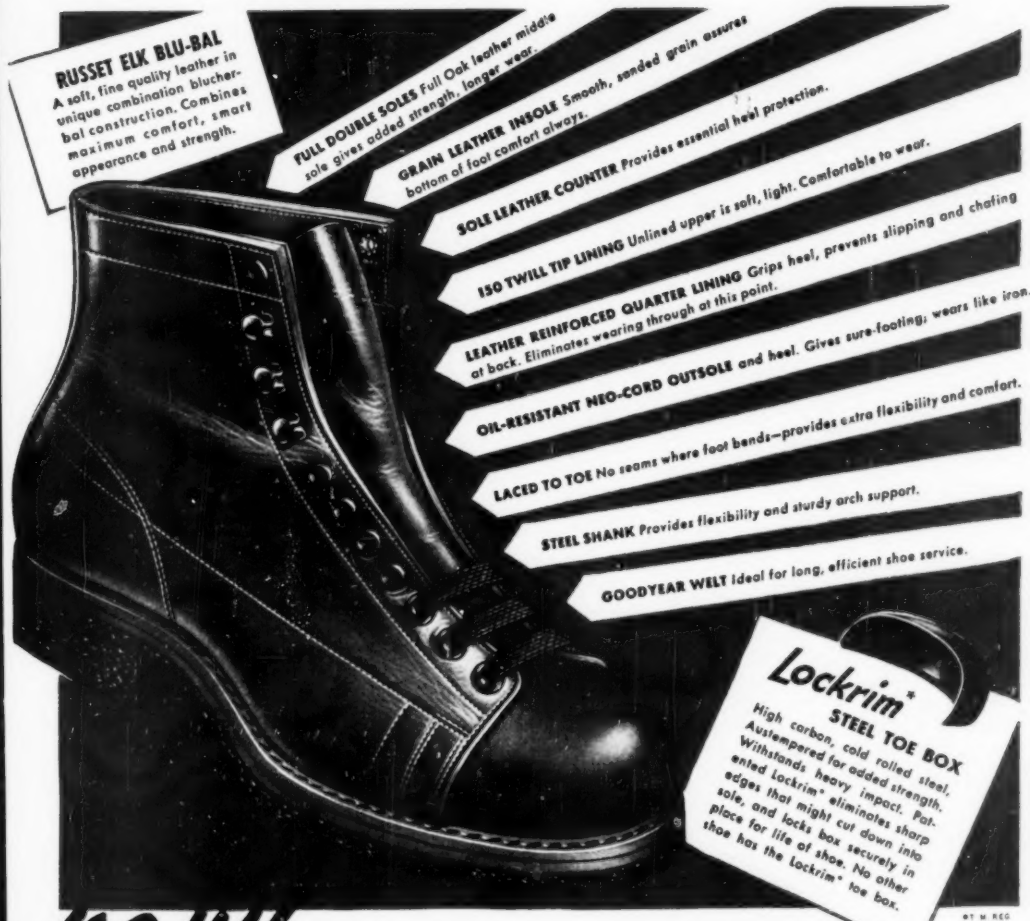
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PAT. M. REG.

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# It's Safe to Say

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## ★ BIG BRASS

WHEN safety trophies are awarded for meritorious achievement in accident reduction, it is common practice for a top-ranking official to receive the award on behalf of the organization or group. This custom prevails not only in the industrial world but also in connection with government offices, the Navy and the Army.

It is of course quite proper that top officials take justifiable pride in achievements reflecting credit upon subordinates and those for whose safety big brass must bear responsibility. Nevertheless, the question suggests itself: whose work really earned the award and who should be honored by receiving it?

In far too many cases, those on the actual firing line who have put forth Herculean effort must content themselves with seeing a photograph of some ivory-towered executive receiving a trophy for service to safety. This picture usually is accompanied by press releases of an uninspired, ghost-written address extolling the virtues of safety, home, fireside and all the other platitudes so dear to the hearts of politicians. It is small wonder that apathy is engendered in the general staff and supervisory force.

Obviously, in the case of a great corporation, it is impossible to honor publicly all those contributing to the cause of accident prevention. Some representative must be chosen to act for the plant personnel in accepting a well-earned tribute. Too frequently, however, those most vitally concerned are ignored in the ceremonies while the big brass is bathed in the spotlight and takes all the bows.

It is ironic that executives whose lip service to safety is casual in the extreme are quick to grasp the opportunity to seek the center of the stage. To paraphrase a bromide, it would seem that nothing succeeds like the *appearance* of success. On the other hand, top officials whose deep concern for life and property protection is manifested daily usually are the first to "render unto Caesar" the credit appropriately due the man in charge of safety activities, whatever may be his working title.

It is indeed refreshing when there arises a happy exception to a rather dreary custom. A case in point is offered by notice of a special ceremony late last month when General Omar N. Bradley, Army Chief of Staff, presented the Department of the Army's Meritorious Civilian Service Award to Eliot V. Parker, Army Safety Director and Chief of the Safety Branch, the General Staff agency charged with administration of the Army Safety Program.

In honoring a great safety leader, SAFETY ENGINEERING is proud to publish the actual citation read to Mr. Parker in the presence of an assembly of distinguished guests gathered at the Pentagon:

> "For meritorious service in performance of duties as U. S. Army Safety Director and Chief of the Safety Branch, Personnel and Administration Division, General Staff, United States Army, from April 1946 to December 1948. By outstanding and exemplary performance above and beyond his directed assignment as U. S. Army Safety Director, he developed the world-wide Army Safety Program which has effected tremendous savings in money, manpower and equipment and gave the U. S. Army a single, unified attack against wasteful and unnecessary accidental suffering and loss.
>
> "He demonstrated a high fidelity and devotion to duty which are a credit to the General Staff, United States Army."

In the last analysis, safety trophies generally are won because safety directors, supervisors and the working force usually are destined, alas, to remain unsung heroes.

## ★ GOLDEN JUBILEE

WITH the advent of 1949, Alfred M. Best Company, Inc., publishers of SAFETY ENGINEERING, celebrates its 50th year of continuous publishing activity.

It was in 1899 that our President and Editor-in-Chief, Alfred M. Best recognized the need for certain types of highly specialized, informational publications which would have as their common objective the dissemination of reliable facts and figures concerning the financial position, operating results and general reputation of insurance companies without recourse to bias.

Mr. Best has continued as active head, with the Company gradually adding other publications to its roster as the need developed. Its growth has stemmed from one annual publication to many annuals, monthly magazines, weekly services to subscribers, bulletins, etc. It was in 1936 that the parent Company absorbed SAFETY ENGINEERING to round out its general service to industry in general, compensation policyholders and to insurance companies seeking unbiased safety information of practical value in the crusade for conservation of life and property and the reduction of preventable losses. H.A.

*With Water Tank and Vacuum for Rug Scrubbing*

*With Dispenser for Hot Waxing*

★

*Interchangeable Brushes, Pads, Sanding Disc*

*Wire Brushes*

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THE *Multiple-Purpose*
FLOOR-MAINTENANCE MACHINE THAT'S
# *Two Sizes in One!*

Here is a floor-maintenance machine that not only can be used for many types of floor care, but also affords the further economy of a machine that is two sizes in one. This *100 Series Finnell*, in one of the larger sizes as shown above at left, can be reduced to the small size unit shown in circle.

Note the low, trailer-type construction of the machine, and how easily it goes beneath furnishings. Thus it is ideal for use in crowded areas. In fact, the dual size feature and low construction of the machine adapt it to use on many floors otherwise inaccessible to machine care.

As easy to handle as a household vacuum cleaner, yet this *Finnell* is powerful . . . fast . . . and thorough. Mounts a G. E. Drip-Proof Capacitor Motor . . . is equipped with Timken Bearings. And the ruggedly constructed worm drive, housed in an extra-capacity leak-proof gear case, lubricated for 1500 hours, assures smooth, noiseless performance. A precision product throughout. Three sizes: 13, 15, and 18-inch brush diameter.

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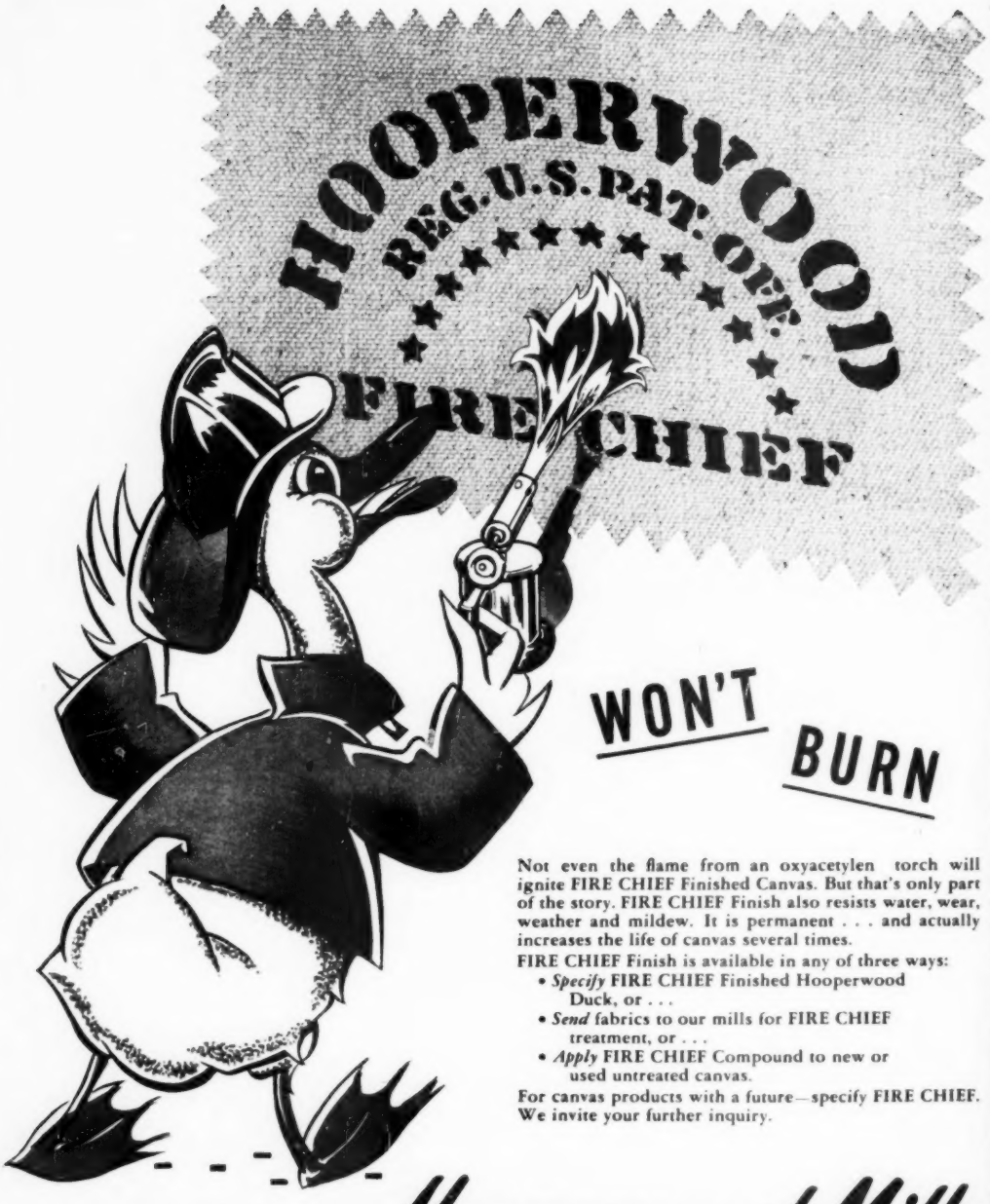


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Not even the flame from an oxyacetylen torch will ignite FIRE CHIEF Finished Canvas. But that's only part of the story. FIRE CHIEF Finish also resists water, wear, weather and mildew. It is permanent . . . and actually increases the life of canvas several times.

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- *Send* fabrics to our mills for FIRE CHIEF treatment, or . . .
- *Apply* FIRE CHIEF Compound to new or used untreated canvas.

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23

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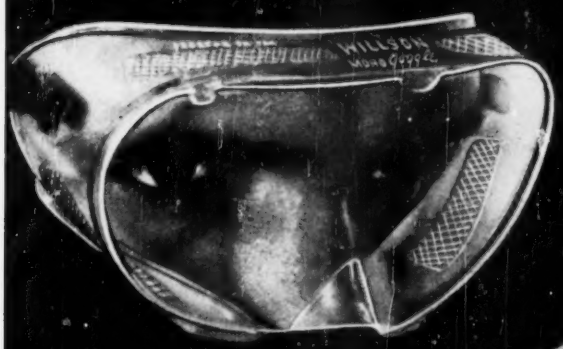
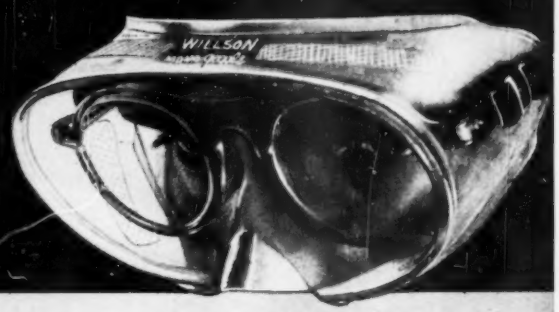
# 2 NEW WILLSON MONO *Goggles*




Some like 'em CURVED




Some like 'em FLAT

Newly styled plastic eye protection with choice of curved or flat lenses offer new features designed to add to their already predominant popularity. The WILLSON MONO-GOGGLE, just over an ounce in weight, is the answer to getting safety equipment worn on many hazardous jobs.

- The new flat lens design retains all the safety features of the curved lens.
- Both provide ample room for wearing of prescription glasses in comfort. The flat style, however, provides additional clearance for molded spectacle frames.
- New drop-eye shape gives wider vision.
- Greater ventilation area provides better air circulation and more wearer comfort.
- Both new designs available in clear acetate frames or the new flexible, mottled-brown, polythene frame.

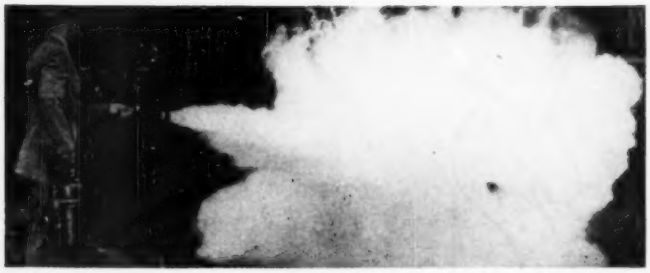
WILLSON*

For complete information on these products and their application, as well as other eye and respiratory protective devices, get in touch with your Willson distributor or write us direct.

*T. M. Reg. U. S. Pat. Off.

WILLSON PRODUCTS, INC., 233 WASHINGTON STREET, READING, PA.

SAFETY ENGINEERING
VOL. 97, NO. 1 • JANUARY, 1949

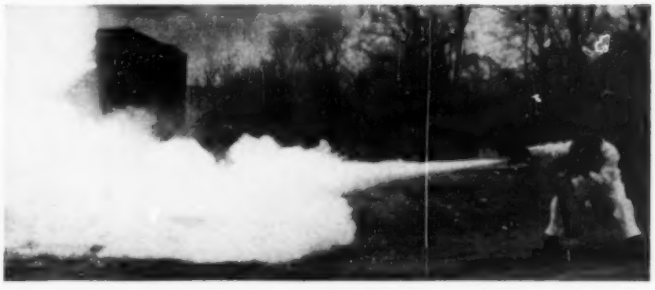


Dry chemical fire extinguisher smothers fire in an open tub of gasoline with a swirling stream of fine powder. Trigger finger control leaves one hand free for most effective direction of discharge nozzle.

FEATURE

This is the fifth of a series of five major articles on Fire Extinguishers. Previous articles of this series were published in the September through December 1948 issues of SAFETY ENGINEERING.

By MARIO deMATTEO,
Fire Protection Institute,
New York City



Long range of the discharged dry chemical enables fire fighter to combat flames from a safe distance. The small particles of fine dry-chemical powder can reduce flash fires in a matter of seconds.

# DRY CHEMICAL

## An Old Formula . . . . . With a New *Punch!*

**In 1949 keep your eye on the dry chemical fire extinguisher. It is just hitting its stride in beating oil, electrical and some textile fires.**

DURING the 1920's a small cardboard package was being peddled and the peddlers claimed that the contents of the package would extinguish a fire quickly.

The content of this make-shift fire extinguisher was sodium bicarbonate and the peddlers' claims were almost right. But too often, climatic conditions hardened the contents, and a purchaser in distress found it necessary to throw pieces of the extinguishing agent at the fire with little effect. Even when climatic conditions were favorable and the extinguishing agent remained in powdered form, the effect of the agent on a fire depended on the tossing skill of the user or his willingness to brave heat and flames to make his throw good.

The extinguishing ability of sodium bicarbonate had been known by the fire protection industries. However, three obstacles had to be overcome before the agent could join the family of existing approved fire extinguishers:

1. Steps had to be taken to reduce sodium bicarbonate to a fine powder to keep it from caking in an extinguisher.

2. Pressure had to be supplied to expel the powder with sufficient force to permit the user to fight a fire at a reasonably safe distance.

3. Nozzles had to be devised to permit a fire fighter to control the throw and deploy the agent where it was most needed.

These barriers were overcome by 1930, when a dry chemical fire-fighting device was submitted to the Underwriters' Laboratories for impartial testing and the device passed rigid performance tests satisfactorily.

Today the composition and fineness of the dry chemical charges may vary with the manufacturer, but the materials added to sodium bicarbonate have made it free flowing, making dry chemical fire extinguishers an effective fire-fighting agent available for class B and C fires (fires in oils, flammable liquids etc. and *(To page 40)*

By PERCY A. SIGLER, MARTIN N. GEIB, and THOMAS H. BOONE,
National Bureau of Standards

SLIPPERY walkway surfaces are responsible for a large number of serious injuries and accidental deaths each year. Haste and carelessness on the part of the users are frequently contributing factors. A survey of accidents in a large Government building in Washington revealed that out of 492 "lost time" injuries reported during a 19-month period, 313, or 64 percent, were due to slips and falls on walkway surfaces. According to the safety engineer who compiled the statistics, a total of 809 slips and falls were reported during the period. Of these, 496 were recorded as "no lost time" injuries. In an endeavor to reduce the frequency of such accidents, a joint research has been undertaken by the National Safety Council and the National Bureau of Standards directed toward developing data that may be used by a representative sectional committee in the preparation of a code for safe walkway surfaces. The Council is conducting a statistical survey of accidents from falls, and the Bureau is engaged in an engineering study of both walkways and footwear materials, which are equally involved in slipping.

The establishment of a safety code for walkway surfaces has been materially handicapped by the lack of an adequate method of measuring slipperiness. The correlation

FEATURE

This is the first of four feature articles concerned with Safe Flooring. The next three articles of the series will be published in the February, March and April 1949 issues of SAFETY ENGINEERING.

**Are your floors safe?**

**The National Bureau of Standards has devised an instrument for measuring the slipperiness of walkway surfaces. Tests made on a number of different types of floors show their relative safety under both wet and dry conditions.**

# DANGER UNDERFOOT

between coefficients of friction (degree of slipperiness) as commonly measured, and slipperiness as actually experienced, is not good, especially where wet surfaces are involved. Therefore, one of the first requirements of the project was the development of a suitable instrument and method for measuring slipperiness.

A walkway surface is often thought of as having a single coefficient of friction. Such is not the case. Slipperiness is not confined merely to the walkway or to the contact surface of the footwear but is a function of both surfaces and is materially affected by their condition. This would be quite evident to anyone who attempts to dance on a waxed floor with rubber-soled shoes in place of leather-soled shoes. Rubber soles snub, whereas leather soles slide readily. Whether the surfaces are clean or dirty, dry or wet, are also material factors.

### Human Locomotion

A study of the mechanics of walking was made as an aid in the design of testing instruments.

Slow-motion pictures of people walking were taken with concealed cameras so that the subjects were unaware of being photographed and were thus likely to be walking naturally. These pictures reveal that the leg slows down at the termination of its swing and then appears to vault onto the walkway, the other leg being used as a pole. They also show that the foot is first placed upon the walkway at an angle so that only the rear edge of the heel contacts the walkway surface during the early stages of the retarding phase of a step. The other foot remains in contact with the walkway, thus bearing part of the vertical load, until the heel rocks forward and the foot is fully planted.

A survey of worn heels showed that maximum wear usually occurs at the outside border of the rear portion of a heel. The contour of this worn portion is generally in the form of a curve rather than a straight line.

Probable angles that heels of shoes make with a walkway surface at the first instant of contact were determined from the motion pictures and from the contour of worn heels. For 35 men's shoes, the angle of contact ranged from 11° to 32°, with an average value of 23°. For 16 women's shoes, including both high and low heels, the angle ranged from 12° to 32°, with an average value of 19°. For 38 worn heels, the maximum angle that tangents to the worn portion made with a horizontal plane ranged from 19° to 33°, with an average value of 26°.

According to the study, the horizontal component of the force exerted by the leg on a walkway surface reaches a maximum in the forward direction shortly after the heel makes contact with the walkway, decreases rapidly at first and then slowly as the foot deploys, and rapidly reaches a maximum in the backward direction as the ball of the foot prepares to leave the walkway. These horizontal components are the forces that must be counteracted by friction in order to avoid slipping.

### Slipperiness Tester

The location of a floor relative

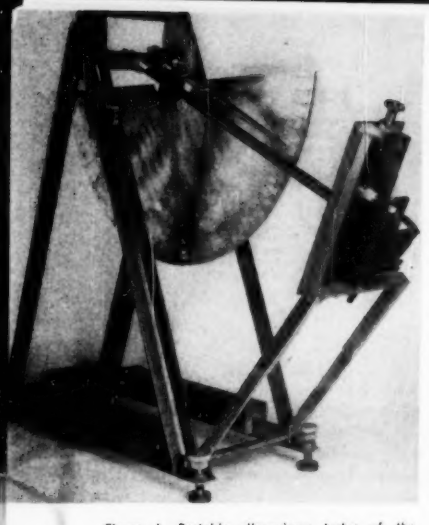


Figure 1. Portable slipperiness tester of the pendulum-impact type, used for testing floors.

to exterior doors or manufacturing processes where floors are normally wet, oily, or coated with various types of waste materials determines to a large extent the texture of its worn surface and thus its slipperiness. The surface of a marble or concrete floor may become scratched and roughened to an appreciable degree from wear when located close to a street entrance, whereas the surface of a similar floor may become smooth or even glazed when located some distance from a street entrance or other source of abrasive grit.

It is extremely difficult to reproduce such a variety of surfaces by artificial means. Therefore, it is desirable that a slipperiness tester be so designed that it can be used to test floors in actual service. Such an instrument has been designed and constructed at the National Bureau of Standards (see fig. 1). The design is based on the premise that, in the process of ordinary walking, slipping is most likely to occur when the rear edge of the heel contacts the walkway surface.

By means of a pendulum, a heel material strikes and sweeps over the walkway surface to be tested. A mechanical heel (see fig. 2) forms the lower end of the pendulum and is so arranged that a 1½-in.-square test piece of rubber, leather, or other heel material can be attached to the underside at various angles so that only the rear edge of the test piece makes contact with the walkway. A helical spring is used to press the edge of the test piece against the walkway during contact. A pointer attached to the framework indicates on a scale (see fig. 1) the maximum height to which the center of gravity of the pendulum rises above its lowest (plumb) position.*

The assumption is made that during the entire distance of contact between the heel and walkway surface the variation in pressure follows a straight-line relationship. This is not strictly correct as some vibration is set up in the mechanical heel as a result of the impact on the walkway. The vibrations occur mainly during the first portion of the contact and appear to follow a similar pattern for smooth-faced materials. In view of the probable effect on the results of large differences in the amount of vibration, it is felt that the present instrument is not suited for testing very rough or embossed surfaces.

The maximum linear velocity attained by the edge of the heel from a release height of 10 in. is approximately 150 ft/min. The total weight of the instrument, including the two brass weights to keep the instrument from being displaced by the impact of the mechanical heel on the walkway, is approximately 27 lb.

### Test Procedure

After the required adjustments † are made, the edge of the heel material is lightly ground with No. 3/0 abrasive paper and thoroughly brushed so as to maintain it in a uniform condition. With the spacer removed, the pendulum is then released from a definite height, 10 in., and the edge of the heel permitted to sweep over the walkway surface. The height to which the center of gravity of the pendulum swings beyond a plumb position * is used to compute the antislip coefficient. The apparatus is then moved to another location and the procedure repeated.

Tests have shown that the surface of a walkway is usually changed by repeated sweeps of the mechanical heel over the same location. In order to be able to duplicate test conditions, separate test pieces or heels are used for testing under wet conditions. The edges are lightly ground, and the test pieces immersed in water for at least ½ hr. prior to making the tests. This is particularly important for absorbent materials such as leather, as the results are influenced by the degree of wetting, being lower with increase in wetting. When testing under wet conditions, a puddle of water is maintained on the floor surface.

It is recognized that the edge of

---

* Both the potential energy of the pendulum at the beginning of a swing and its residual energy at the end of a swing can be determined from the known weight and position of the center of gravity of the pendulum. The difference, or loss in energy, is equal to the work done in sliding the mechanical heel over the walkway surface, which is the average frictional force times the distance of contact. By definition the average frictional force is equal to the coefficient of friction times the average force normal to the plane of contact. From these relations an equation can be established for the coefficient of friction, or what we prefer to call the "antislip coefficient," in which all factors except the scale reading at the end of the swing are known constants of the instrument.

The values of these constants for the Bureau's instrument are the weight of the unbalanced portion of the pendulum, W = 3.17 lb; the effective height of the center of gravity of the pendulum at the beginning of a swing, H = 9.8 in; the distance of contact, D = 3.76 in; the force pressing the edge of the heel against the walkway surface ranges from a minimum of 6.1 lb at the beginning and end of contact to a maximum of 7.4 lb at the midpoint of contact, giving an average force, P = 6.75 lb.

For theoretical considerations, the average force as an arithmetical mean introduces a slight error because the variation in the force is dependent upon an arc rather than upon its subtended chord. The error has been calculated to be approximately 2 percent and does not affect the relative order of the results.

From the above relations and constants, the equation for the antislip coefficient, $U$, is found to be

$$U = \frac{W(H - h)}{DP} = 1.244 - 0.125h,$$

where $h$ is the scale reading or height of the center of gravity of the pendulum at the end of the swing when the usual contact between the mechanical heel and walkway surface is made.

* $h$ value.

† The test procedure consists in leveling the instrument, by means of screws and a spirit level, in the direction of the swing of the pendulum and so that the edge of the heel is parallel to the walkway surface in the direction perpendicular to the swing. At the same time the edge of the heel must be adjusted to a definite height in relation to the walkway surface. The instrument itself is used to maintain this latter adjustment constant. With a ⅛-in. spacer, placed between the hinged metal strap, $A$, and the stop, $B$ (see fig. 2), the height of the heel is adjusted so that the scale reading at the end of a swing of the pendulum, released from a scale reading of 10, is lowered by 0.1 in., that is, from 9.8 to 9.7. The normal frictional loss of the instrument, including that of the pointer, is 0.2 in. The ⅛-in. thickness was selected as suitable control of the distance of contact. A small mirror clamped on the brace at the front of the instrument and a flashlight are used to facilitate the adjusting of the instrument when conducting tests on floors in actual service.

a heel may become coated with wax, dirt, oil, or other foreign material during the process of walking. Likewise, particles of grit may become embedded in the heel and the edge appreciably roughened when walking over rough surfaces. Repeated tests on a waxed asphalt tile corridor without buffing the edge of a leather test heel between sweeps of the mechanical heel showed that the results changed for the first three tests and then became relatively constant. The antislip coefficients for the latter tests were approximately 20 percent lower than for the first test and were approximately 10 percent lower than for the second test.

### Effects of Varying Constants of the Instrument

Statistical analyses of data obtained with the instrument show that the standard deviations from the means usually range between 0.01 and 0.03. Where fairly uniform walkway surfaces are involved, representative values can be obtained by averaging the results of from three to five individual measurements for each test condition.

The effect of varying the angle of contact between the heel and the walkway surface was investigated. Angles of contact used were 10°, 20°, and 30°. In general, the antislip coefficients were found to decrease slightly with increase in the angle of contact. However, the differences in the results were too small to be considered significant, and an angle of 20° was adopted for general use.

The effect of varying the force and thus the pressure between the heel and the walkway surface was also investigated. The force normal to the walkway surface was varied by installing helical springs of different strength on the mechanical heel. The three springs used exerted an average force of 3.7, 6.7, and 11.2 lb, respectively. Although these forces may seem small, because of the small area of contact, they represent an approximate variation in pressure of from 40 to 120 lb/in$^2$. Significant differences in the results were observed, especially under dry conditions (see table 1). In general, lower antislip coefficients (greater tendency to slip) were obtained with increase in the pressure. For any given pressure, however, the antislip characteristics of the different walkway surfaces tested maintained a similar relative order. A similar tendency for the antislip coefficients to decrease with increasing pressure was also noted from a comparison of results obtained with test heels having appreciably worn and rounded edges and results obtained with test heels having unworn and square edges. Therefore, the antislip coefficients obtained by this method should be considered as relative rather than absolute values, and the establishment of a minimum antislip coefficient for walkway surfaces as a specification or code requirement would have to be based on a definite method of test.

Table 1. Effect of Varying the Pressure Between the Mechanical Heel and the Walkway Surface

| Walkway surface and test heel | Antislip coefficient with spring exerting average force of— | | |
|---|---|---|---|
| | 3.7 lb | 6.7 lb | 11.2 lb |
| Tennessee marble: | | | |
| Rubber heel, dry | 0.81 | 0.75 | (a) |
| Leather heel, dry | .46 | .40 | 0.35 |
| Asphalt tile: | | | |
| Rubber heel, dry | .99 | .93 | (a) |
| Leather heel, dry | .64 | .56 | .54 |
| Rubber tile: | | | |
| Rubber heel, dry | .94 | .81 | .69 |
| Leather heel, dry | .45 | .40 | .35 |
| Rubber tile containing alundum grit: | | | |
| Rubber heel, dry | .88 | .81 | .69 |
| Leather heel, dry | .52 | .44 | .38 |
| Linoleum: | | | |
| Rubber heel, dry | .95 | .84 | .69 |
| Leather heel, dry | .49 | .39 | .30 |
| Felt-backed tile, cellulose nitrate composition: | | | |
| Rubber heel, dry | .86 | .74 | .60 |
| Leather heel, dry | .41 | .32 | .24 |

[a] Pendulum stalled.

### Results and Discussion

Typical results obtained with both rubber and leather test heels and under both dry and wet conditions are given in table 2. The standard abrasion compound specified in Federal Specification ZZ–R–601a, Rubber Goods; General Specifications, was used as rubber test heels. The leather test heels conformed to *(To page 56)*

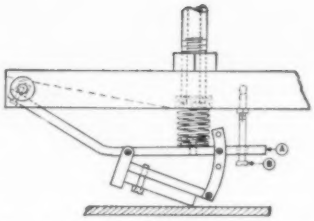



Figure 2. Details of mechanical heel with metal strap A and stop B.

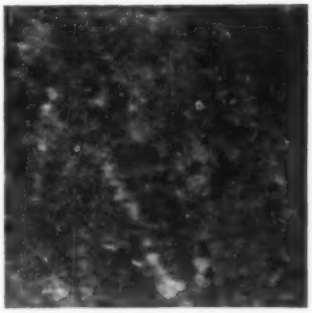


Figure 3. Photomicrograph of terrazzo floor, test 4 in table 2. (Magnification: X30.)

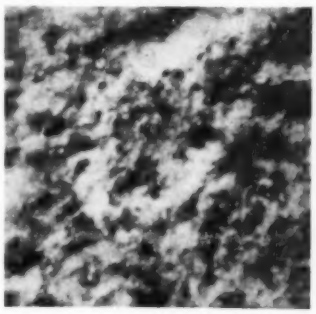


Figure 4. Photomicrograp of soapstone stair tread, test 7 in table 2. (Magnification: X30.)

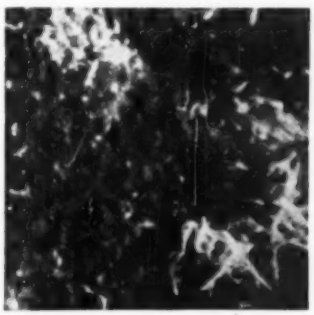
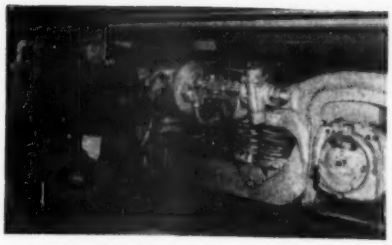


Figure 5. Photomicrograph of rubber and cotton matting, test 21 in table 2. (Magnification: X30.)



Car inspector applying bad order card to a car that arrived on the Chief. The card requires repairs to truck and rigging.

# Safety Rides the Rails On the Santa Fe

By ALBERT A. MOREY, Vice President, Marsh & McLennan, Inc., Chicago, Ill.

**Railroad safety doesn't just happen. It is the result of the combined efforts of many unseen hands.**

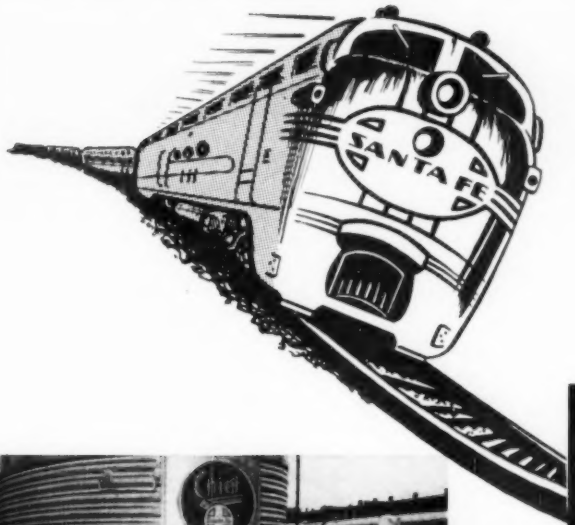
TODAY, the Atchison, Topeka and Santa Fe operates over 13,000 miles of mainline railroad from Chicago to the Pacific and the Gulf.

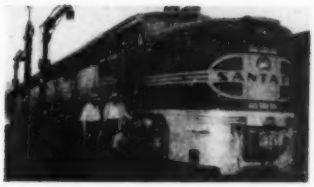
Its pioneer path had to conquer such obstacles as mountains, deserts, rivers, and the hostile Indian. The Santa Fe in 1869 opened 17 miles of track from Topeka to Carbondale, Kansas. In 1872, the line reached westward to Newton. Later, visionary men pushed the line through to Colorado and heaved it over the Rockies to the fabulous frontier state of California. Those pioneer railroaders were looking toward the future. Today that future has been realized in the giant sleek diesels whittling away the miles between great cities. But these modern trains still are linked with the old romantic west. Their names are a salute to the past: the Chief, the Super Chief, the Grand Canyon Limited, the California Limited, the Texas Chief, and the El Capitan.

For twenty years, I have ridden the Santa Fe System over a quarter of a million miles. Their 66,000 employees have combined to get me to my destination and home again safely. As a "Veteran of Safety," I was interested in finding out how it was possible to ride these many miles without one unsatisfactory experience—and on faster and faster schedules. Permission was given me to check the Santa Fe's accident prevention procedures. It included the privilege of riding in the cab of the "Chief" from Chicago to Kansas City, over a stretch of track where an astounding safety record has been compiled —a record of *four and one half billion* passenger miles in a ten-year period without a single fatality. This record includes a total of over *thirty three million* train miles.

## Planning for Tomorrow

Such records are truly a story of planning for tomorrow—a story which begins with the designing of equipment for safety as well as for speed and comfort. Through scientific engineering, passenger cars can reach high speeds without




Round house and road foremen with mechanic make inspection of trucks on the Chief's locomotive.

**THE Santa Fe Railway was recently presented a special award by the National Safety Council for bettering its safety record 25% in 1947 compared with the previous year. The improvement was accomplished through an intensive safety campaign and expansion of the safety department.**

**Santa Fe President, Fred G. Gurley, in accepting the award, said, "Preventing injury to even one human being is one of the greatest things we can hope to accomplish."**

Inspection of the Chief's cars on arrival in the Chicago yards by an unbeatable team of experts: Stupas, Gear and Paulos. The inspection pit is provided with lights to facilitate underneath inspection of wheels, brakes, etc.

undue strain with maximum comfort. Santa Fe maintains a modern test department staffed by capable engineers, chemists, and technicians whose job it is to analyze the iron, steel, and alloys that go into the making of a streamlined car and a diesel locomotive. To build a train like the "Chief," 99 to 1,000 drawings are required, 3,000 to 4,000 templets or patterns, and 70,000 man-hours of engineering in addition to developments in older trains.

What are some other important items of safety incorporated into the building of a passenger car?

1. Collision posts (standard steel section uprights at extreme ends of car to prevent telescoping of the superstructure in the event of derailment, collision, or other accident).

2. All vertical posts in superframing have gusset plates at connection, which strengthen overall rigidity and prevent weaving and racking in service over a period of years.

3. Generators and other underneath equipment have safety supports to prevent their dropping down on rail in event breakage takes place, which would cause derailment.

4. Fireproof insulation in all cars protects against a fire developing in side walls or interior of cars.

5. Present day braking equipment on lightweight cars gives evenly distributed brake application through train thereby giving smoother train operation for the safety and comfort of passengers.

### Smoothness and Power Through Maintenance

Few industries can compete with the railroads in rigid safety inspections. Mechanical forces inspect each car very minutely before departure from the terminal—wheels, axles, roller bearings journals, brake rigging, couplers, vestibule doors, springs, equalizers, steps, etc. It is said that a pit crew of three old timers, Messrs. Stupas, Gear, and Paulos of the Chicago Maintenance Depot—each with over a quarter century of experience—can literally "smell a crack" in a wheel. After seeing these inspections, one begins to understand why these fast trains can be kept running day after day—on time and safely.

The following represents the concerted effort of what an experienced service team in face of rain, snow, ice, and high temperatures can do to keep the equipment in excellent running condition.

1. Air brakes are tested on each individual car.

2. Additional air tests are made to see that air *(To page 42)*

# NOT THE SAME OLD *Grind*

**Unsafe grinding wheels are a liability. Watch out for the six ways they can decrease production.**

by C. B. CANNON
Industrial Safety Educational Service
Chicago

CENTURIES ago prehistoric cavemen found a way of sharpening weapons of combat by rubbing stone upon stone. Basically this principle still stands in the maintenance of the tools of industry.

As necessity of survival increased there was developed in a later era the grindstone which came into being as the tool for sharpening implements of war, agriculture and crude industry.

High on the list of inventions necessitated by the march of progress in a mechanized world is the grinder and obviously without this vital tool efficiency and production could not have reached their present state of development.

## Danger of Grinding

In evaluating the plus features of grinders we must concern ourselves with the minus as well. Apparently the path toward progress and the race for always greater efficiency bring in their wake new hazards when a new process or tool is introduced on the industrial scene. It is here that industry, to its eternal credit, makes one of its greatest contributions in recognizing the entry of new hazards accompanying new processes and takes adequate steps to guard against what otherwise would be certain death and injury. The grinder can be a dangerous tool without effective safeguards. In fact, many workers have been killed by exploding wheels improperly enclosed; others have been permanently disabled; and countless victims have lost the blessing of eyesight for lack of goggles in the presence of eye hazards. Other injuries have occurred caused by makeshift, inadequate shields, and statistics are replete with cases where grinders had no shields whatever. Far too many employees suffer grave consequences when the

dangerous grit from the grinding wheel was breathed into the lungs instead of being carried away into an exhaust device.

### Eye Protection

Fortunately, hoods made according to specifications of the American Standards Association are protecting thousands of industrial personnel and progressive management has seen the value of enforcing mandatory rules requiring the operator to wear an approved eye safety device. In actual fact, some form of "goggle" is required for both men and machine if we are to embrace the ultimate in accident prevention measures.

At the turn of the century industrial employers recognized that accidents could be reduced by placing some form of glass over the grinder and this safeguard was merely the first step in the right direction to lessen lay-offs, increase production, cut down the appalling toll in human suffering, and reduce financial leakage. Experts who began devoting their lives to the cause of safety improved this now primitive measure by using laminated glass to minimize greatly the danger of shattering glass which merely introduced a secondary hazard into an already hazardous operation.

### Lighting as Protection

Later a student of production conceived the idea of placing an electric bulb in the shop over the grinder. He had observed that unless there was adequate light on the other side of the glass, the operation was handicapped further. This principle is the same as that which motivated successful stores which keep their display windows lighted in daylight as a means of reducing reflection and glare.

A solution to the problem is now offered to the industrial world through the use of illuminated shatter-proof grinder shields. Later developments demonstrated the need of large windows to avoid eye fatigue when the worker found it necessary to view an operation while grinding on various parts of the wheel. A major development along this line consisted of placing two lamps to illuminate properly the point of operation on any part of the grinding surface. While all these steps have been done to safeguard human and property welfare, safety experts have discovered that adequate and proper illumination pays big dividends in increasing production. In short, scientifically designed, properly serviced grinding-wheel safeguards protect the body, the eyes and even the lungs of the operator whose efficiency and vitality can be lessened over a period of time by the insidious hazard of grinding dust.

All these advantages prove to American management that safety is not just a part of production, rather safety *is* production!

Illustrations by courtesy of the Industrial Safety Educational Service.

## Six Reasons for Reduced Production

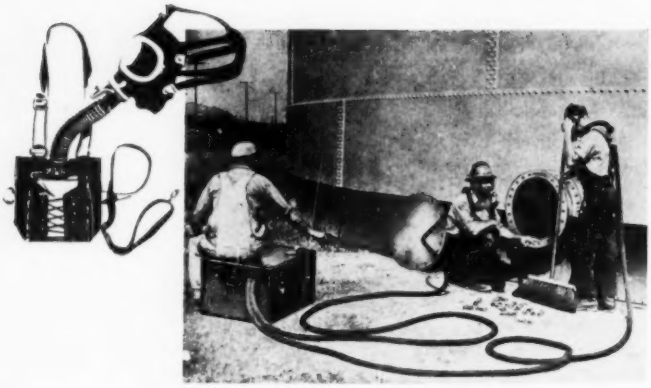


Figure 1—Hose mask with blower ( = 1905A) supplying two operators.

By WILLIAM E. McCORMICK,

# INHALE

## A DESCRIPTION OF SUPPLIED AIR

TWO types of personal respiratory protective devices, useful in the control of harmful atmospheric exposures to working personnel, are Supplied Air Respirators and Gas Masks. As in the case of all equipment of this type, the use of these devices should be limited to supplementing other methods of controlling occupational disease hazards, or for limited occasional or emergency use. The U. S. Bureau of Mines approves devices of both of these types. The following discussion pertains only to those personal respiratory protective devices which are thus approved. Respiratory devices approved by the U. S. Bureau of Mines are listed in the accompanying tables.

### Supplied Air Respirators

Supplied Air Respirators function by supplying to the wearer a respirable atmosphere from some source independent of the wearer's immediate environment. Four different types of this device are in common use: (1) the hose mask with blower, (2) the hose mask without blower, (3) the supplied air (air line) respirator, and (4) the abrasive blasting helmet.

*1. The hose mask with blower. See Table 1.*

These devices consist essentially of a full face piece connected to manually operated blowers by means of a low pressure type hose. They are intended for use both in contaminated atmospheres and those which may be deficient in oxygen, and will provide adequate protection in atmospheres which may be immediately dangerous to life. The wearer is equipped with a life line to better facilitate his removal from the contaminated area in case of accident. The blower is located in an area from which respirable air can be secured. The blower is then manually operated by a second individual, forcing air under a slight positive pressure to the wearer. These devices are designated by the U. S. Bureau of Mines as Type A Supplied Air Respirators and are approved for a maximum length of hose of 150 feet. The requirements for approval also demand that the inhalation breathing resistance not exceed 2½ inches of water column height. Some of the units are approved for use of two operators simultaneously, as shown in Fig. 1.

*2. Hose mask without blower. See Table 2.*

This type of mask is intended for non-emergency use in atmospheres which are not immediately dangerous to life. It consists of a full face-piece covering and a large diameter, low-pressure type breathing tube of a maximum length of 25 feet. In operation the open end of the breathing tube is kept in an area of respirable air, while the wearer is located in a contaminated atmosphere. The wearer thus inhales directly from an uncontaminated area. No air is supplied manually or mechanically. The diameter of the hose must be kept large and relatively short in order that the breathing resistance be kept low. These devices are classified as Type B Supplied Air Respirators

Table 1

Hose Mask with Blower

| Name of Respirator | Approval Number | Date of Approval |
|---|---|---|
| 1. M.S.A. Combination hose mask | 1901 | May 29, 1929 |
| 2. Davis hose mask | 1902 | March 30, 1931 |
| 3. Bullard hose mask | 1903 | April 14, 1933 |
| 4. Davis hose mask | 1904 | October 29, 1934 |
| 5. M.S.A. combination hose mask* | 1905A | July 2, 1935 |
| 6. Davis hose mask | 1906 | Aug. 2, 1935 |
| 7. Acme supplied-air respirator (A) | 1910 | July 16, 1938 |

* An extension of approval 1905A was issued Sept. 20, 1937 to American-La France & Foamite Industries, Inc., for the La France fresh air mask.

Medical Division, The B. F. Goodrich Co., Akron, Ohio

# WITH SAFETY

## RESPIRATORS AND GAS MASKS

by the U. S. Bureau of Mines. A commercially available type of this device is shown in Fig. 2.

*3. Compressed air (air line) Respirators. See Table 3.*

This is probably the most commonly used Supplied Air Respirator. An illustration of it is shown in Fig. 3. It consists of a facepiece covering which may be of either the full or half mask type, a high pressure air supply system, a short hose connecting the face piece to the air supply, and a detachable coupling with a suitable reducing valve. These devices are intended for non-emergency use and should not be used under any circumstances in atmospheres which may be immediately dangerous to life. They will give protection against all of the various atmospheric contaminants. Their proper operation depends upon providing an adequate supply of high pressure air to the wearer in amounts somewhat in excess of his breathing requirements. This means that at all times excessive air should be flowing through the exhalation valve or about the periphery of the face piece. These devices are termed Type C Supplied Air Respirators by the U. S. Bureau of Mines. They are approved for various lengths of hose up to a maximum of 250 feet. It is obvious, of course, that the air supply to this device must receive special attention. It is the responsibility of the user rather than the manufacturer of the device to provide a proper air supply. The Bureau of Mines approval requires that no pressure in excess of 25 lbs. per sq. inch gauge be used on these devices. Most of the manufacturers of this type of respirator provide a small activated carbon filter in the air supply line near the detachable coupling. The purpose of this is to remove small quantities of *(To page 30)*

Table 2
Hose Mask without Blower

| Name of Respirator | Approval Number | Date of Approval |
|---|---|---|
| 1. Davis air-line mask | 1913 | March 10, 1939 |
| 2. Bullard Simplex hose mask | 1916 | October 14, 1939 |

Table 3
Airline Respirators

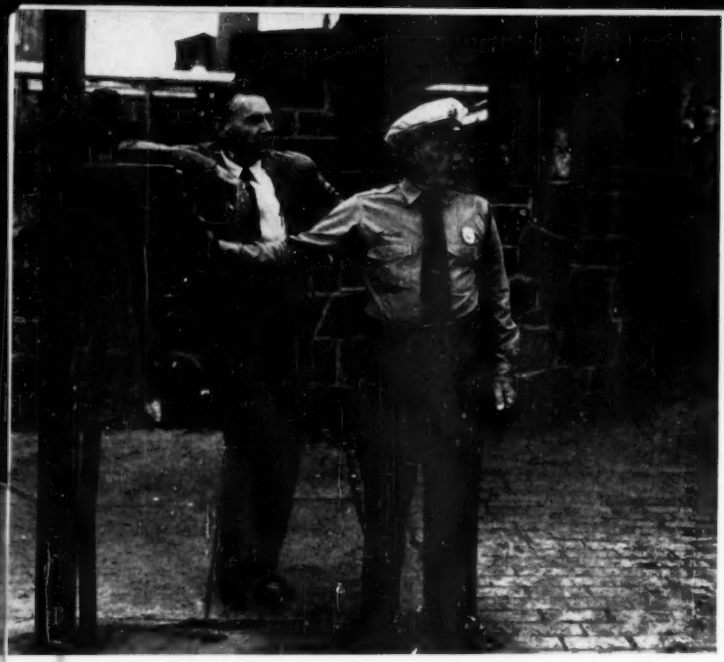
| Name of Respirator | Approval Number | Date of Approval |
|---|---|---|
| 1. M.S.A. air-line respirator | 1909 | July 15, 1938 |
| | 1909A | May 19, 1947 |
| 2. Willson air-line respirator (GA, GB, GC) | 1912 | Oct. 7, 1938 |
| 3. Cesco direct air mask (#602) | 1917 | Aug. 17, 1940 |

Figure 2—Hose mask without blower ( = 1913).

**FEATURE**

This is the second of a consecutive series of three major articles dealing with Respiratory Protection. The third feature of the series will appear in the February 1949 issue of SAFETY ENGINEERING.

Figure 3—Type C supplied air respirator ( = 1909).



EARLY IN THE MORNING, Marcus Hook employees stream across the busy street in front of the plant. Plant Guard C. Galvin operates the traffic light for their safety while Thomas Phillips watches.

SAFETY SLOGAN board is explained to the new employees. The slogans are changed each week.

# Safety 'Round the Clock

### A Day in the Life of a Safety Supervisor

TOM PHILLIPS, Safety Supervisor at the Marcus Hook plant of the American Viscose Corporation, is an energetic, quick-moving man, with an easy smile and a friendly air. His office looks like a combination bulletin board and report center—the desk is covered with neat piles of safety reports, booklets, informational literature, equipment catalogues, and miscellaneous pieces; the walls are almost blanked out by a huge chart outlining departmental organization, another chart showing past safety records, several safety slogans and calendars, and bookcases filled with background material. It's obviously the office of a man deeply concerned with his job.

But Mr. Phillips isn't in his office much of the time. His job is out in the Marcus Hook plant, talking to people, inducting new employees, inspecting possible unsafe conditions, listening to suggestions, meeting safety committeemen. He knows the plant inside and out, for Tom Phillips has been with Avisco for 32 years. He was a foreman in the Viscose Department until he took on his present assignment in 1945.

Each of the Avisco plants has different problems to meet in running a safety program. Local conditions differ, production operations are not all alike, equipment and machinery vary from plant to plant. But each has an all-over safety program, under the direction of the corporation safety supervisor, which is a 24 hour a day, year in and year out, affair. It reaches into every department, every job. It patrols the long corridors in the form of warning signs, traffic mirrors. It provides goggles and face shields where they are needed, safe tools and equipment. All employees are urged to obtain medical care for even the smallest of injuries.

But a safety program depends primarily on the men and women who take part in it. They are the plant safety council, the depart-

FIRST STOP in day's program is at Dispensary to discuss previous day's report with plant nurses. L. to r.: Mrs. Marjorie Terwilliger, Mrs. Dorothy Atherholt, the head nurse, Mrs. Lillian Gilken, Safety Supervisor Phillips.

NEW EMPLOYEES are met by Mr. Phillips, who, after a short talk with them, escorts them to departments where they will work.

UNIVERSAL GAS MASK is worn by Arthur Greenman before entering the chlorine storage area to check leak. Masks are furnished.

WARNING SIGN on inside of women's locker room door cautions employees before they go into the corridor to look for trucks.

SAFETY PRECAUTIONS are observed by Machinist Earl Brown at emery wheel. Note use of safety goggles and grinder eye shield.

ment safety committee members, the doctors and the nurses, the Union safety representatives. They are also every man and woman employee, for safety won't work unless it is everybody's business.

A safety program is an around the clock program. It can't sleep, as long as machines continue to operate and people continue to work together. Following Tom Phillips about on a typical day will give a better understanding of how one company works toward the safety goal. *(Pictures continued next page.)*

Story and pictures by courtesy of the American Viscose Corporation's "Avisco News."

UNION SAFETY representative, James Robinson, right, discusses safety program with Phillips. Robinson is in Spinning Dept.

EYE PROTECTION is discussed by Phillips and W. L. Smith, Viscose Dept. Head. Phillips worked formerly in this department.

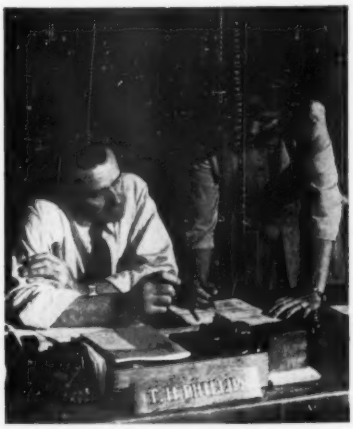
TRAFFFIC MIRROR at right shows pedestrians, the approaching traffic and enables truck operators to see people at crossing.

SAFETY SUGGESTIONS are talked over daily with, left to right: Joe Scott, Marcus Hook Master Mechanic; Phillips; John Hulstine, Supervisor Sheet Metal Dept.; Ellis Lewis, Supervisor of Electric Dept. Projects of safety committeemen are reported each month.

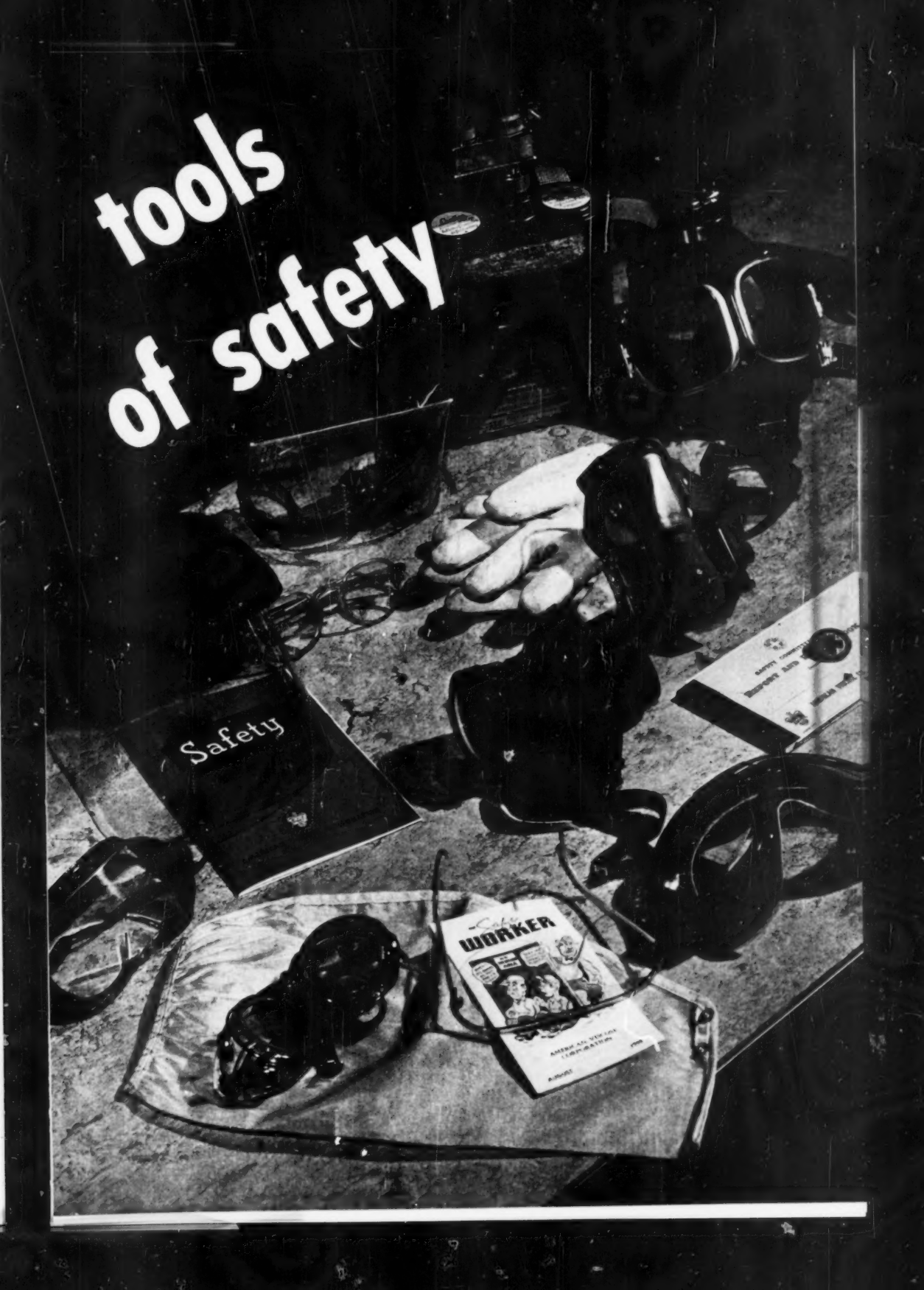
PLANT SAFETY COUNCIL meets once a month. It is an advisory body, consisting of representatives from various departments. Their mission is to sponsor safety in the plant and make recommendations for the possible solution of safety problems. They also initiate activities promoting individual safety in action and in thought.

DOLLAR WINNER is Henry Ronso, right. Names of all employees are spun in the slogan barrel each week.

SAFETY SLOGAN is painted by Bill Ganster. Signs are displayed in four prominent places. Copies are placed on bulletin boards.



END OF THE DAY finds Tom Phillips and secretary Joyce Rollison reviewing day's report from all departments of the plant.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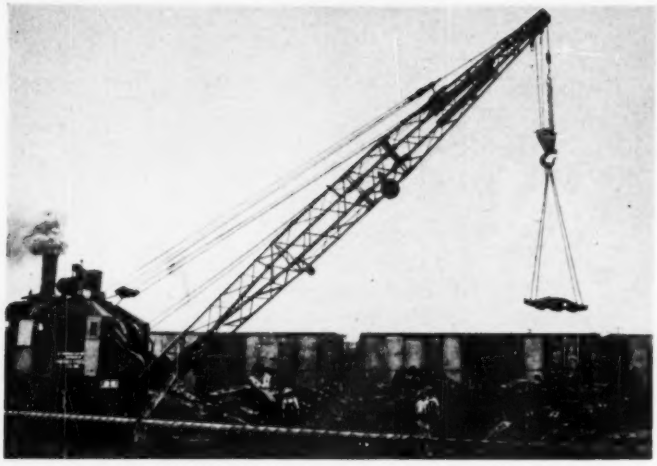
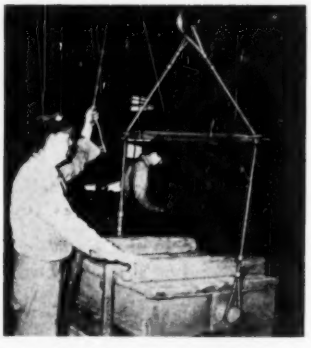


A railroad crane with long reach moves castings over the tops of box cars in loading yard. Double basket strand-laid sling provides a quick, safe hook-up for handling loads which are hard to balance.

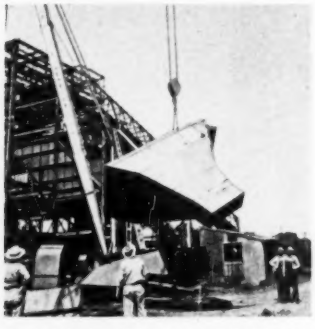
To rig cable-laid choker sling, place the sling around load. Insert one loop through the other.

# LET'S TALK ABOUT

By DOUGLAS H. DYER



Two-leg bridle sling with a spreader bar makes a light-weight, easy-to-handle connecting link.



The single-basket hitch is fast and flexible. It's the rigger's favorite where load can't slip.

WHILE it's a little past the time of year when good resolutions are generally made, it is THE time right now to make a study of the practices you employ in selecting, rigging, and condemning the slings you use. Slings must be safe. They lift costly loads over men and machines. An improper sling can crush or sear its load. The result is a loss. It may be to an expensive machine that would take months to replace, meanwhile tying up production. Frequent accidents to personnel create further losses because of time out, to say nothing of the increased insurance rate.

## The Connecting Link

A sling is the connecting link between crane or hoist and the load. Down through the years certain types of hitches were evolved by riggers. Some of them proved efficient. Some didn't. It was the trial and error way, always expensive, but it was progress. Today there are three basic wire rope sling styles which, with modifications, provide security in holding loads to be hoisted, lowered, carried, or suspended. These styles are known as basket, bridle, and choker.

## Basket Sling

The basket sling is a single piece of wire rope usually with a loop at each end. One end is run through openings in loads such as girders, baskets, handles, etc., where it is possible to balance the load, or where balance is of no importance. Rigging the basket sling requires little time, and the two loop ends are quickly slipped over the crane hook.

## Double Basket Sling

The double basket sling is a modification of the basket style. It consists of two units, or legs, and provides support under two ends of loads which are difficult to balance. It is easily adapted to shafts, pipes, mill rolls, armatures, and large objects where the sling

Tighten the choke at point of balance. Keep choke taut as loop is placed over crane hook.

Have the operator raise hook and load a short height. Check the hitch and be sure of balance.

Hitch is O.K. Load is balanced perfectly. The three-ton column is ready to swing into place.

# WIRE ROPE SLINGS

**How to pick the right sling—the safe sling for each job.**

must support the load from underneath.

### Bridle Sling

A bridle sling is one which is used as a straight connection between crane hook and load. One end is connected to the side or top of the load and the other end to the crane hook. The pull is direct and great life can be expected from the sling because there is little wear from abrasion or bending. A one-leg bridle sling is used for lifting objects which have a convenient point of attachment such as motors, machinery housings, etc., which have an eye on top.

### 2-, 3-, and 4-Leg Bridle Slings

Multiple-leg bridle slings are used to adapt this style to a variety of loads, either balanced or unbalanced. The two-leg bridle is used widely where two convenient points of attachment to the load are provided for the sling's loop ends or hooks.

The three-leg bridle is generally used for awkward, unbalanced loads. Typical applications are flywheels, gears, large pipe flanges, castings and clumsy machine housings. In some cases one leg is longer than the other two in order to level the load and provide balance and directional stability in both vertical and horizontal movements.

The four-leg bridle sling is generally the safest to use. With four-point suspension of the load, the tendency to twist is reduced and the operator has greater control. The original cost of a four-leg bridle sling compares favorably with that of other types of slings because, with the weight of the load divided between the four legs, smaller diameter wire rope can be used.

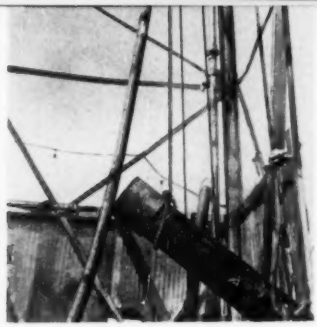
### Choker Slings

The choker sling makes its own attachment to the load. As its name indicates, this style of sling is a form of sliding loop which compresses tightly around the load. By choking, it provides a non-slip grip. The choker hitch is easy to make and is used to prevent slippage in handling pipe, rods, and other shapes which will withstand crushing. While the single choker is more commonly used, the double choker is very popular as it gives greater stability to the load.

### Basic Constructions

From the time that wire rope was first made, which dates back around 1846, it has been used for lifting and suspending things. Its steel wires offered greater strength, and broken wires were a danger signal that told well in advance when the sling should be replaced. But those early wire ropes had their drawbacks when used for slings. The wires were too big and too stiff. The steel was too soft. An improperly made rope with a high or low strand would be unbalanced thus reducing its breaking strength. The load would twist and unwind the strands of the rope, causing the hand spliced loop to open and drop the load. *(Continued next page)*

Load of creosoted poles, supported by a double basket strand-laid sling, is moved to freight car.



Speedy hook-up to casing makes the 8-part braided sling a time-saver for the oil well driller.

Four-leg bridle sling holds sheet steel section in place while being welded into the structure.

Today a variety of wire rope constructions enables the manufacturer of wire rope slings to choose a construction which will suit the particular use to which the sling will be put. And new methods of fastening loop ends and fittings on slings at the factory assure greater safety.

★ ★ ★

## "Select-A-Sling"

## THE EXACT Registered SLING YOU NEED

### HOW TO USE THIS TABLE

If you have any questions about the one best wire rope construction for the sling you need, this table will help you decide.

1. Select STYLE OF SLING—Basket, Bridle, or Choker. Write down the four figures shown on that line.
2. Select three or more SERVICE REQUIREMENTS. Write down the four figures which are on the same lines with each of the three or more features you choose.
3. Total each column. One with highest score indicates type of wire rope sling construction you need for the particular job.
4. See EXAMPLE below.

**STYLES OF SLINGS**

BASKET BRIDLE CHOKER

| | SELECTION COLUMN | STRAND LAID | CABLE LAID | BRAIDED 6-PART | BRAIDED 8-PART |
|---|---|---|---|---|---|
| STYLE OF SLING (select one) | BASKET | 80 | 90 | 100 | 90 |
| | BRIDLE | 100 | 95 | 60 | 70 |
| | CHOKER | 75 | 90 | 80 | 100 |
| *SERVICE REQUIREMENTS (select 3 or more) | Abrasion Resistance | 100 | 60 | 75 | 60 |
| | Bending Strength | 60 | 90 | 100 | 90 |
| | Cutting Resistance | 80 | 70 | 100 | 75 |
| | Flexibility | 70 | 100 | 50 | 100 |
| | Kinking Resistance | 60 | 100 | 75 | 100 |
| | Stretch Resistance | 100 | 80 | 60 | 60 |
| | Strength-Weight Ratio | 100 | 90 | 80 | 80 |
| | Twisting Resistance | 60 | 60 | 100 | 100 |
| | Uniformity of Cross-Section | 100 | 100 | 70 | 80 |

YOU WANT: → A choker-type sling to handle rough and irregular castings.

| EXAMPLE | | | | | |
|---|---|---|---|---|---|
| | Choker | 75 | 90 | 80 | 100 |
| | Abrasion Resistance | 100 | 60 | 75 | 60 |
| | Bending Strength | 60 | 90 | 100 | 90 |
| | Flexibility | 70 | 100 | 50 | 100 |
| | Kinking Resistance | 60 | 100 | 75 | 100 |
| | Totals | 365 | 440 | 380 | 450 |

**RESULT:** High score indicates 8-Part Braided.

| *NOTE: If cost is an important item, include these figures. | | | | | |
|---|---|---|---|---|---|
| | Strength-Cost Ratio | 100 | 36 | 29 | 19 |

### Strand-Laid Slings

There are four popular sling constructions. Strand-Laid is the term applied to right regular lay wire rope when used as a sling body. In diameters from $\frac{1}{4}$-inch to 1-inch, 6 x 19 preformed wire rope is used, while 6 x 37 preformed is used for the larger diameters, both having independent wire rope cores to reduce crushing. On ordinary lifting jobs, or where cost and strength are the two main considerations, Strand-Laid slings are the most economical.

### Cable-Laid Slings

Cable-Laid is the term applied to sling body constructions made from seven individual 7 x 7 ropes, or seven 6 x 19 ropes with independent wire rope cores, laid into a single rope. In a Cable-Laid body, what would ordinarily be a strand of a rope is actually a separate and complete wire rope. In diameters of 9/32-inch to $\frac{3}{4}$-inch, preformed aircraft-grade cable is used, while from 1-inch to $1\frac{1}{2}$-inch diameters, preformed improved plow-steel grade is used. These constructions are highly flexible and compare favorably in this respect with fibre rope; but, at the same time, they provide the safety of all-steel construction. Cable-Laid sling bodies have high strength, extreme shock resistance, and full freedom from crankiness. They are very easy to handle and to rig up. Their greater numbers of wires laid in a combination of right and left lays make them highly resistant to kinking.

Laying or pulling pipe is easy using wire rope sling with plain loop end rigged as choker.

Single-leg loop end type sling in basket hitch is used in shop to lift a heavy road roller.

Two three-leg bridle slings, plus two-leg bridle rigged to spreader bar, lift prefabricated roof.

### 6-Part Braided Slings

6-part Braided slings are a special development. The sling body is made up of six separate Strand-Laid ropes which are braided into a relatively flat body. This flat surface adapts 6-part Braided for use where it is desired to spread the area of contact with the load and lower the bearing pressure on the individual strands of the rope. This design reduces cutting of the sling body where it comes into contact with sharp edges or rough surfaces, and great strength is added at the points of bend. Further, the resistance to twisting of 6-part Braided slings makes them particularly desirable for loads which have a tendency to rotate.

### 8-Part Braided Slings

8-part Braided slings are another special development. Eight separate Strand-Laid ropes are braided in pairs into a symmetrical body that gives a highly efficient combination of all-around flexibility and the utmost strength in bends. The 8-part Braided body resists kinking, twisting, and cutting. This construction is really the tops in lifting capacity, because, using 8 parts of 1¼-inch rope, the rated capacity on a single leg with a safety factor of five-to-one is as high as eighty tons.

### Choosing the Construction

In choosing the construction you need— Strand-Laid, Cable-Laid, 6-part or 8-part Braided—there is a table prepared by a wire rope sling manufacturer* that can be of great help. It consists of a set of values assigned to each service requirement for each of the four sling body constructions. You first select the style of sling—basket, bridle, or choker—then choose three or more service requirements such as abrasion resistance, flexibility, and twisting. By totaling the values under each sling body construction, you have a recommendation for the best sling body. It eliminates guesswork and greatly increases the life expectancy of the slings you select.

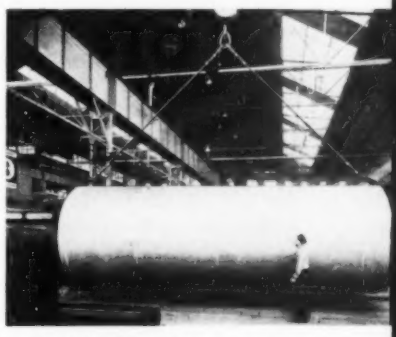
### Home-Made Slings

Many sling users still make up their own slings. Frequently, a used rope from a crane or derrick will be cut up and the best looking sections set aside for making into slings as they are needed. This is a dangerous practice. Even though not one of the outer wires is broken and there appears to be no low or high stranding of the good sections of the rope during the time it was used on the crane or derrick, it still is an unsafe practice. Facilities for proof-testing the good portions of the old rope are seldom available, so it is impossible to calculate with any degree of accuracy the safe load that might be applied to such a "home-made" sling. Then there is the unknown efficiency of the hand-splice which may not be equal to more than 50 per cent to 75 per cent of the rope's breaking strength. Add to these uncertainties the danger of sharp wire ends at the splice injuring workmen, and you *(To page 49)*

* Name of manufacturer furnished on request.

Double basket sling easily lifts belt conveyor of portable gravel plant used in road building.

A double choker made from two 6-part braided wire rope slings is used to lift a loaded drum.



Two-leg bridle sling with special hooks lifts 8' x 24' dehydrator tank weighing 23,500 pounds.

# INHALE WITH SAFETY

## Supplied Air Respirators and Gas Masks

Figure 4. Abrasive blasting helmet (# 1918).

*(From page 21)* moisture and oil vapors from the air supply. These filters, however, will *not* remove carbon monoxide. Internally lubricated compressors of the type most commonly used for supplying compressed air for factory use frequently operate at temperatures sufficiently high to cause some combustion of the lubricating oil into carbon monoxide. It is, therefore, imperative that any air supply on which respirators of this type are used be thoroughly investigated to determine the presence of carbon monoxide under operating conditions.

There are commercially available small compressors which are especially designed for supplying air to Type C Supplied Air Respirators. These units are portable and are electrically operated. They do not use oil as an internal lubricant and as a result the air supply from them is carbon-monoxide free.

*4. Abrasive blasting helmets. See Table 4.*

These devices are fundamentally a modification of the Type C Supplied Air Respirator. The modification consists of substituting a head- and face-piece covering capable of withstanding the impact of shot and grit as used in abrasive blasting. An illustration of this device in use is shown in Fig. 4. The supplying to the wearer of a continuous stream of fresh air is necessary in excess of his breathing requirements, just as in the case of Type C. The statements pertaining to the quality of this air that were made in the preceding discussion apply equally here. The wearer's head and face are constantly bathed with clean, fresh air. A slight positive pressure is maintained within the head covering, thus preventing inward leakage from the contaminated atmosphere. Excess air constantly spills out around the neck or shoulder periphery. These devices, too, are not intended for use in areas from which escape without them is impossible.

### Gas Masks

Gas masks are frequently termed air purifying respirators. These devices provide protection to the wearer by removing the contaminants from the inhaled air. Consequently their use is restricted to atmospheres which are not deficient in oxygen. The basic design of these devices consists of an air-purifying canister containing the necessary sorbents, and a breathing tube connecting the canister to the face-piece covering. The face piece is of the full type, and is usually made of rubber. It is held in place by an elastic head strap and is equipped with shatterproof lenses, designed to provide the maximum in vision to the wearer. Commercial masks at the present time are designed in such a manner that the inhaled air enters the face piece through suitable channels at ports located immediately beneath each eye lens, and thus assist in reducing fogging. Also, the exhaled air is exhausted through a separate valve in such a manner that it is not rebreathed by the wearer.

These devices are intended for emergency use, and, provided sufficient oxygen exists in the atmosphere, can be worn in areas where lethal concentrations of gases or vapors occur. There are three general classifications of gas masks at the present time approved by the Bureau of Mines.

*1. Those intended for protection against a specific gas or a combination of gases. See Table 5.*

Examples of this are those designed for protection against ammonia, organic vapors, acid gases, chlorine, etc. They are approved for maximum concentrations of 2% by volume, with the exception of ammonia which is 3%. The service life of the canister obviously depends upon not only the amount of sorbent it contains but also upon the atmospheric conditions under which it is used and the rate of inhalation of the wearer. Users of these devices should be instructed

**Table 4**

**Abrasive Blasting Helmets**

| Name of Respirator | Approval Number | Date of Approval |
|---|---|---|
| 1. M.S.A. abrasive mask | 1907 | July 15, 1938 |
| | 1907A | May 19, 1947 |
| 2. Pangborn blast helmet (DD-4) | 1908 | July 15, 1938 |
| 3. Sly Purair helmet | 1911 | July 16, 1938 |
| 4. Willson abrasive blasting helmet (#31) | 1914 | March 10, 1939 |
| 5. Pangborn blast helmet (DF-2) | 1915 | March 23, 1939 |
| 6. Cesco Healthguard mask (#602) | 1918 | Jan. 4, 1941 |
| 7. M.S.A. Blastfoe abrasive helmet[1] | 1919 | Oct. 1, 1946 |
| 8. M.S.A. abrasive mask[2] | 1920 | April 30, 1948 |
| 9. Bullard abrasive blasting helmet (#V) | 1921 | Sept. 9, 1948 |

[1] An extension of approval 1919 was issued to B. F. McDonald Co. on Oct. 3, 1946 for the McDonald Blastfoe abrasive helmet.
[2] An extension of approval 1920 was issued to Metallizing Engineering Co., Inc., on April 30, 1948 for the METCO abrasive mask.

to replace the canister at the first signs of the passage of the contaminated gas or vapor into the face piece as evidenced by eye or respiratory irritation or odor. A supply of fresh canisters should be at all times available for replacement purposes. Where protection against only a specific gas or gases is desired this is the mask to be chosen. It is shown in Fig. 5.

*2. Those intended for protection against all gases, including carbon monoxide, and limited protection against smoke. See Table 6.*

These gas masks are now termed the Universal Type (see Fig. 6). The canister consists of various sorbents arranged in layers to provide the maximum amount of protection to the wearer against all toxic gases and vapors. Inasmuch as carbon monoxide possesses no warning properties, a small timing device is incorporated in masks of this type to enable the wearer to determine the time for canister replacement. These canisters are ordinarily designed for two hours of normal usage. This time, of course, may be increased or decreased depending upon the conditions under which it is worn and the volume of air which passes through it. They are approved for a maximum concentration of 2% by volume of all of the contaminants with the exception of ammonia for which the maximum limit is 3%. These canisters will also afford respiratory protection against smoke from ordinary fires and limited protection against dusts, fumes, and mists. They do not, however, afford adequate pro-

**Table 5**
**Gas Masks for Specific Gases**

| Name of Mask | Approval Number | Date of Approval |
|---|---|---|
| Type A: Acid Gas Masks | | |
| a. Hydrocyanic Acid (Canister Color: White with Green Stripe) | | |
| 1. M.S.A. hydrocyanic acid gas mask | 1413 (regular-size canister) | Dec. 9, 1933 |
| | 1414 (super-size canister) | Dec. 9, 1933 |
| 2. Davis hydrocyanic acid gas mask | 1424 | Dec. 11, 1939 |
| 3. Willson hydrocyanic acid gas mask [1] | 1428 | Aug. 30, 1940 |
| 4. Bullard hydrocyanic acid gas mask | 1431 | Feb. 10, 1941 |
| [1] An extension of approval 1428 was issued May 20, 1947 to E. D. Bullard Co. | | |
| b. Chlorine Gas (Canister Color: White with Yellow Stripe) | | |
| 1. Acme chlorine gas mask | 1421 | April 21, 1939 |
| 2. M.S.A. chlorine gas mask | 1422 | May 26, 1939 |
| 3. Willson chlorine gas mask [1] | 1426 | March 8, 1940 |
| 4. Davis chlorine gas mask | 1427 | June 26, 1940 |
| 5. Bullard chlorine gas mask | 1430 | Feb. 10, 1941 |
| [1] An extension of approval 1426 was issued May 20, 1947 to E. D. Bullard Co. | | |
| Type B: Organic Vapor Mask (Canister Color: Black) | | |
| 1. M.S.A. organic vapor mask | 1415 | July 28, 1936 |
| 2. Davis organic vapor mask | 1417 | May 3, 1938 |
| 3. Acme organic vapor mask | 1418 | May 13, 1938 |
| 4. Bullard organic vapor mask | 1419 | July 15, 1938 |
| 5. Willson organic vapor mask [1] | 1423 | Oct. 6, 1939 |
| 6. Willson organic vapor mask [2] | 1437 (large-size canister) | Aug. 5, 1944 |
| 7. M.S.A. organic vapor mask | 1441 (super-size canister) | Aug. 2, 1946 |
| [1] An extension of approval 1423 was issued May 20, 1947 to E. D. Bullard Co.<br>[2] An extension of approval 1437 was issued May 20, 1947 to E. D. Bullard Co. | | |
| Type AB: Acid Gas and Organic Vapor Masks (Canister Color: Yellow) | | |
| a. Acid Gas and Organic Vapor | | |
| 1. M.S.A. acid gas & organic vapor | 1409 | Jan. 23, 1930 |
| 2. Davis acid gas & organic vapor | 1411 | Jan. 19, 1931 |
| b. Hydrogen Sulfide and Petroleum Vapor | | |
| 1. M.S.A. hydrogen sulfide & petroleum vapor | 1410 | July 16, 1930 |
| 2. M.S.A. hydrogen sulfide & petroleum vapor | 1412 | Sept. 14, 1931 |
| 3. M.S.A. hydrogen sulfide & petroleum vapor | 1416 | June 16, 1937 |
| | 1416A | July 1, 1937 |
| Type C: Ammonia Gas Masks (Canister Color: Green) | | |
| 1. M.S.A. ammonia gas mask [1] | 1401 | April 10, 1920 |
| 2. M.S.A. ammonia gas mask | 1404 | March 10, 1926 |
| 3. M.S.A. ammonia gas mask [4, 5] | 1406 | Feb. 14, 1928 |
| 4. Davis ammonia gas mask [2, 3] | 1408 | Dec. 19, 1928 |
| 5. Acme ammonia gas mask | 1420 | March 25, 1939 |
| 6. Willson ammonia gas mask [6] | 1425 | Dec. 20, 1939 |
| 7. Bullard ammonia gas mask | 1429 | Feb. 10, 1941 |
| 8. Willson ammonia gas mask (large canister) [7] | 1438 | Sept. 22, 1944 |
| 9. M.S.A. ammonia gas mask (super-size GMD canister) | 1442 | Aug. 29, 1946 |

[1] An extension of approval 1401 was issued June 23, 1927 to American-La France & Foamite Industries, Inc.
[2] Originally issued to Bullard-Davis, Inc., later transferred to Davis Emergency Equipment Co., Inc.
[3] An extension of approval 1408 was issued Nov. 18, 1930 to American-La France & Foamite Industries, Inc.
[4] An extension of approval 1406 was issued May 17, 1938 to B. F. McDonald Co.
[5] An extension of approval 1406 was issued Feb. 20, 1946 to American-La France & Foamite, Inc.
[6] An extension of approval 1425 was issued May 20, 1947 to E. D. Bullard Co.
[7] An extension of approval 1438 was issued May 20, 1947 to E. D. Bullard Co.

Fig. 5—Industrial gas mask (# 1423) designed for protection against a specific type of vapor.

Figure 6—A universal gas mask (# 1405). Note timing device immediately above the canister.

**Table 6**
**Universal Gas Masks**

| Name of Mask | Approval Number | Date of Approval |
|---|---|---|
| 1. M.S.A. All-Service gas mask | 1403 | July 1, 1925 |
| 2. M.S.A. All-Service gas mask [1] | 1405 | Aug. 24, 1928 |
| 3. Willson universal gas mask (WUG-N1) [2] | 1432 | Feb. 2, 1942 |
| 4. Acme All Purpose gas mask | 1435 | Sept. 30, 1942 |
| 5. Bullard universal gas mask | 1439 | May 16, 1945 |

[1] An extension of approval 1405 was issued Oct. 2, 1937 to B. F. McDonald.
[2] An extension of approval 1432 was issued May 20, 1937 to E. D. Bullard Co.

tection against toxic smokes of warfare.

*3. Those which afford protection against all toxic gases and vapors and against toxic dusts, fumes, smokes, etc. See Table 7.*

These masks are the same as the immediately preceding type except that there is incorporated in the canister a mechanical filter which will remove finely divided dispersoids of the type used in chemical warfare. These canisters are especially useful for industrial operations where finely divided toxic dusts and mists may be encountered together with toxic gases and vapors.

*4. Self-rescue device for carbon monoxide protection. See Table 8.* This device is intended for emergency escape from carbon monoxide contaminated atmospheres—particularly coal mines. The commercial model is sufficiently light to enable its being carried on the miner's belt. It consists of a small canister containing the necessary chemicals for removing carbon monoxide from the inhaled air, and having directly attached to it a mouth grip and nose clip. It is hermetically sealed in a steel case which in turn is attached to the belt. In an emergency necessitating its use, the seal is broken, the rubber mouth grip placed in the mouth of the wearer and the nose clip on his nostrils. He then inhales through the device, and thus is better able to escape from the contaminated area. The self-rescuer normally provides about thirty minutes protection. The device is shown in Figure 7.

In general the requirements for approval by the U. S. Bureau of Mines for gas masks require that the breathing resistance on both inhalation and exhalation not exceed certain limits. It is desirable, of course, to keep these values as low as possible thus promoting greater comfort and ease of wearing. Present requirements provide that the inhalation resistance of the complete mask not exceed $2\frac{1}{2}$ inches of water for all masks other than the Universal Type. For these a maximum of $2\frac{3}{4}$ inches of water is permitted. The maximum exhalation resistance for all masks is $1\frac{1}{4}$ inches of water.

Special precautions need to be observed in the use of gas masks for protection against hydrogen cyanide. This vapor can be very readily absorbed through the skin in lethal amounts. As a result even though the canister of the mask may afford adequate protection to the wearer in hydrogen cyanide atmospheres he may absorb sufficient amounts of this substance through the skin to be fatal. Prolonged exposure to hydrogen cyanide atmospheres even with respiratory protective devices should be avoided.

**Table 7**
**Universal Gas Masks with Toxic Dust Filters**

| Name of Mask | Approval Number | Date of Approval |
|---|---|---|
| 1. Willson universal gas mask (WUG-N2) [2] | 1433 | Sept. 9, 1942 |
| 2. M.S.A. All-Service gas mask (Model S) [1] | 1434 | Sept. 30, 1942 |
| 3. Acme universal gas mask (Model FD) | 1436 | Oct. 27, 1943 |
| 4. Bullard universal gas mask | 1440 | May 16, 1945 |

[1] An extension of approval 1434 was issued March 2,1943 to American-La France & Foamite Industries, Inc. for the La France Protexall gas mask.
[2] An extension of approval 1433 was issued May 20, 1947 to E. D. Bullard Co. for the Bullard Universal gas mask.

Figure 7—The self-rescue device (№ 1402) for use in emergencies against carbon monoxide gas.

### Wearing and Maintenance

No respiratory protective equipment will serve its purpose unless it is satisfactorily worn. The wearing of all devices of this type is always uncomfortable, and recommendations for their use frequently meet considerable resistance from those individuals for whom they are intended. It is, therefore, necessary that the wearer of these devices be properly educated in the necessity for their use and in their function. The device must be clean and sanitary. It is preferable to do this in some central location adequately equipped. Reliance on the wearer to do the job is unsatisfactory. Washing with mild soap and water at the end of each day's use, with occasional disinfecting is necessary.

Wearers of those devices which may be used in atmospheres immediately dangerous to life should be especially instructed in order that they may know exactly how to use the device and to recognize its limitation. Failure to do so has been and will continue to be the cause of fatalities.

Pictures by courtesy of the following companies and organizations: Figures 1, 3, 6, 7—Mine Safety Appliances Co.; Figures 2 and 4—U. S. Bureau of Mines; Figure 5—Willson Products, Inc.

**Table 8**
**Carbon Monoxide Gas Device**

| Name of Device | Approval Number | Date of Approval |
|---|---|---|
| 1. M.S.A. self-rescuer | 1402 | March 6, 1924 |

**VISUAL EFFICIENCY**

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# Carbon Dioxide Systems For Storage Vaults

UNDERWRITERS' Laboratories, Inc., in cooperation with the Fact-Finding Committee of The Carbon Dioxide Fire Protection Industry, have issued a fact-finding report on the Carbon Dioxide Protection of Fur-Storage Vaults.

Following is a summary of this report:

1. Early discovery of fires in fur vaults by means of smoke detection equipment and prompt extinguishment tends to minimize fire and smoke damage.

2. Smoke detection equipment, if properly installed and maintained, furnishes prompt and reliable fire detection, well in advance of other detecting devices for fires of a smouldering nature.

3. In properly vented vaults protected by carbon dioxide systems, smoke, fire-created odors and fumes are driven off to some extent, thereby minimizing damage to the vault and their contents.

4. One pound of carbon dioxide for each six cubic feet of space affords positive and complete extinguishment of fires external to the garments and deep-seated fires in tightly packed garments, but less than one pound of carbon dioxide for six cubic feet of space is not effective in extinguishing deep-seated fires inside tightly packed garments.

5. Extreme temperature peaks are quickly reduced by the injection of the carbon dioxide.

6. Visibility within the vault cleared rapidly after the discharge of carbon dioxide.

7. Carbon dioxide penetrates the interior of tightly packed coats and the gas concentration is essentially the same as in the exterior spaces.

8. Carbon dioxide is dry and non-damaging, regardless of the length of time that materials are exposed to this extinguishing medium.

9. The design and location of the vent or pressure relief openings should be such as to afford adequate relief of pressure and escape of smoke from the protected area.

10. Under fire conditions the atmosphere in a protected vault is charged with carbon dioxide and fire gases which are dangerous to life, therefore, the hazard to personnel should be carefully considered. This may vary with each vault, depending upon the size, the material in storage, ladders, stairs, heavy steel doors having time locks and other egress obstructions. (Fifteen seconds was adequate for an individual to leave the test vault from the point most remote from the door).

11. Automatically-operated or manually-operated carbon dioxide systems protecting spaces of large volume should provide personnel escape alarms and system operation alarms in accordance with the Standards of the National Board of Fire Underwriters covering Carbon Dioxide Systems. Pamphlet No. 12.

12. The time period allowed between the alarm and a starting of the discharge of carbon dioxide (to provide for safe exit of personnel) will have to be carefully weighed against the possibility of increasing the fire and smoke damage due to too long delay in release of the carbon dioxide. The tests demonstrated that some fires may progress rapidly.

13. The proper "soaking period" i. e., the time allowed between injection of carbon dioxide and ventilation of a vault thereafter must be ample to accomplish fire extinguishment. The time may vary due to such items as the nature of the fire, the nature and packing of garments on the racks and other materials involved such as sweeping, paper, or other combustibles. Entry into a vault after a fire should always be made by firemen equipped with suitable gas masks, or others so equipped and if the inspection discloses no heat or fire in garments or other material, ventilation of the vault can be started.

14. Some fur vaults are equipped with heavy steel doors having time locks as a matter of protection against burglary. In such cases, thought must be given to the bearing that these doors may have on exit from and entry to the vaults. In case of fire, prompt entry into a closed vault is not essential, as such a vault charged with carbon dioxide usually will present favorable conditions for fire extinguishment.

15. Adequate instructions for action to be taken in case of fire should be conspicuously posted at the entrance to each vault.

Copies of this fact-finding report may be obtained by writing to members of the Fact-Finding Committee of the Carbon Dioxide Fire Protection Industry listed below.

C—O—Two Fire Equipment Co.
U. S. Highway 1,
Newark, New Jersey

American LaFrance Foamite Corp.
Elmira, New York

Cardox Corporation
307 N. Michigan Ave.
Chicago, Illinois

Walter Kidde & Company
675 Main Street
Belleville, New Jersey

## Dravo Shipyard Award

THE Wilmington, Delaware, Shipyard of Dravo Corporation, Pittsburgh, has been given an award by the Delaware Safety Council for the greatest number of "safe hours" worked from July 1, 1947 to January 1, 1948 in all medium size plants throughout that state.

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on page 71.
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# Safety in New Gas Cycling Plant

EXPANSION of the Katy Gas Cycling Plant, 25 miles west of Houston, Texas, one of the world's largest plants of its type, will result in a vast increase in the recovery of propane, one of the liquid petroleum gases, it was disclosed early last fall at the Fall Meeting of The American Society of Mechanical Engineers in Portland, Oregon. Propane is sold as "bottled gas" for domestic fuel, and has many important industrial uses, as in the textile industry, ferrous metal cutting, heat treating, and for enriching utility gas.

Additional propane recovery units now being installed will "increase the propane recovery from approximately 30% to 80% of the hydrocarbons contained in the gas," according to William T. Robertson, design engineer of the Humble Oil and Refining Company, operators of the plant.

Actual plant construction entailed the use of about 75 miles of pipe, Mr. Robertson said, ranging from 2" to 39" in diameter, and not including the additional miles of instrument piping.

In a technically detailed outline of the plant construction, the Humble company engineers described the field system, high pressure gas system within the plant, condensate and distillation systems, and the steam and electric system, the last differing in several respects from most plants of this type. In the plant design it was decided to use steam and electrically driven centrifugal pumps where practical.

Careful study was given to the safety system in the Katy plant. In order to warn the plant operators of trouble in the system, an arrangement of alarm whistles is installed on the various vessels. If the difficulty is beyond the operator's control, a separate set of safety controls will automatically shut down the major mechanical equipment, thus insuring protection for the personnel and plant.


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Write us at once for full details and learn how you can enjoy maximum protection against disease, infection, and dermatitis in your plant with this tremendous discovery, Antiseptic Lanelle Powdered Hand Soap.

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## Danger Underfoot

*(From page 15)* Federal Specification KK-L-261b, Leather; Sole, Vegetable-Tanned, Factory.

All the walkway surfaces gave relatively high antislip coefficients with dry rubber heels, and thus good traction should be experienced with such footwear. In general, much lower coefficients were obtained with dry leather heels, the values ranging from one indicating poor traction, 0.30, to one indicating good traction, 0.50. When wet, many of the surfaces would be classed as potentially hazardous for both rubber and leather footwear. Outstanding exceptions are tests 1, 7, 8, 21, and 22 (see table 2). Good antislip properties under wet conditions are usually associated with irregularities that project through the film of water and thus prevent its action as a lubricant. These irregularities may represent either the roughened surfaces of the walkway or footwear materials themselves or particles of embedded sand or grit. A smooth terrazzo floor showed poor antislip properties when wet, whereas a soapstone stair tread and a rubber and cotton matting having rough surfaces showed fair antislip properties when wet (see figs. 3, 4, and 5 and tests 4, 7, and 21 in table 2).

The results shown for the two concrete floors (tests 1 and 2) and the two vinyl resin floorings (tests 22 and 23) demonstrate the importance of surface condition and the inadvisability of assigning a single coefficient or even a single range of coefficients to one type of flooring.

The antislip properties of terrazzo were improved by the addition of an aggregate containing an abrasive (tests 4 and 5).

A waxed pressed fiberboard was considered to be exceptionally slippery by employees of the establishment where the floor was located. Measurements (test 11) substantiate their experience.

Tests 12 to 15 are representative of a series of tests on panels of brown battleship linoleum treated with different types and brands of floor waxes. Although the tests were made on an actual installation of linoleum, the area was used primarily for test purposes and had been subjected to very little traffic. Thus, the linoleum still retained most of its factory-applied coatings of sealer and wax. The antislip characteristics of the various test panels were found to be quite similar. The greatest slipperiness under dry conditions was obtained with a leather heel on the panel treated with a solvent-type wax (test 13). Machine polishing the panels treated with a water-emulsion wax gave a slightly better traction (tests 14 and 15). A similar tendency was found for other brands tested. The small differences found between one-coat and three-coat applications of the water-emulsion waxes were not consistent for the different brands tested.

Tests 16, 18, and 19 were made on floors being maintained by a particular method and floor polish, which, according to representatives of the hospital where the tests were conducted, has resulted in a material reduction in accidents due to slippery floors. Although these floors would be considered unsafe when wet, the antislip coefficients obtained with a dry leather heel were higher than frequently found for the types of floors involved.

A summary of the results of a rather extensive investigation of untreated and waxed asphalt-tile corridors in a large Government building in Washington is pre-

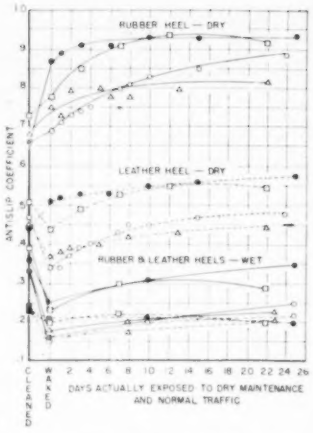


Figure 6. Relative slipperiness of untreated and variously waxed asphalt tile corridors. ——— Rubber heel; - - - leather heel; O, wax A; △, wax B; ●, wax C; □, wax D.

Table 2. Relative Slipperiness of a Variety of Walkway Surfaces

Figures are relative, not absolute. The higher the coefficient, the less slippery the surface.

| Test number | Walkway surface | Antislip coefficient | | | |
|---|---|---|---|---|---|
| | | Rubber heel | | Leather heel | |
| | | Dry | Wet | Dry | Wet |
| 1 | Concrete slab, ground with silicon carbide [a] | 0.65 | 0.60 | 0.37 | 0.43 |
| 2 | Cement-mortar topping, worn smooth [b] | .64 | .28 | .37 | .19 |
| 3 | Paving brick, worn smooth [b] | .68 | .38 | .27 | .27 |
| 4 | Terrazzo, worn smooth [b] | .53 | .25 | .35 | .16 |
| 5 | Terrazzo, containing alundum grit, worn smooth [b] | .74 | .33 | .44 | .18 |
| 6 | Quarry tile, worn smooth [b] | .69 | .28 | .31 | .20 |
| 7 | Soapstone stair tread, sand rubbed finish [a] | .69 | .59 | .42 | .45 |
| 8 | Metal plate coated with phenolic resin and No. 46 alundum [a] | .69 | .45 | .64 | .47 |
| 9 | Yellow pine; sanded (abrasives No. 3, 1½, and 0), sealed (penetrating seal), burnished (steel wool), waxed (water-emulsion type), and polished [b] | .52 | .16 | .19 | .16 |
| 10 | White-oak, maintained with solvent-type wax (*E*), polished [b] | .49 | .19 | .24 | .17 |
| 11 | Pressed fibreboard, maintained with solvent-type wax (*E*), polished [b] | .47 | .15 | .26 | .14 |
| 12 | Linoleum (*M*), scrubbed and cleaned [a] | .68 | .19 | .32 | .10 |
| 13 | Linoleum (*M*), solvent-type wax (*F*), polished [a] | .62 | .19 | .25 | .13 |
| 14 | Linoleum (*M*), water-emulsion wax (*G*), one coat [a]: Not polished | .66 | .19 | .28 | .09 |
| | Polished | .68 | .16 | .34 | .11 |
| 15 | Linoleum (*M*), water-emulsion wax (*G*), *three coats* [a]: Not polished | .70 | .14 | .31 | .07 |
| | Polished | .71 | .16 | .34 | .10 |
| 16 | Linoleum (*N*), maintained with water-emulsion wax (*H*), polished [b] | .67 | .21 | .40 | .20 |
| 17 | Rubber tile (*O*), maintained with solvent-type wax (*E*), polished [b] | .61 | .17 | .29 | .16 |
| 18 | Rubber tile (*P*), maintained with water-emulsion wax (*H*), polished [b] | .80 | .32 | .42 | .20 |
| 19 | Asphalt tile (*R*), maintained with water-emulsion wax (*H*), polished [b] | .82 | .29 | .48 | .24 |
| 20 | Asphalt tile (*S*), maintained with water-emulsion wax (*I*), polished [b] | .76 | .22 | .37 | .15 |
| 21 | Rubber-and-cotton matting, corrugated, worn rough [b] | .61 | .38 | .48 | .32 |
| 22 | Vinyl resin flooring (*T*), worn rough [b] | .59 | .35 | .48 | .30 |
| 23 | Vinyl resin flooring (*U*), smooth molded surface [a] | .47 | .22 | .25 | .21 |

[a] Laboratory specimens in an unworn condition.
[b] Floor areas in actual service.

sented graphically in figure 6. Approximately 800 measurements were involved, with the standard deviations * from the means averaging about 0.02. The tests were made on four different corridors. The floor area of each corridor was approximately 5,200 ft², and thus, measurements could be made at widely spaced, random locations. Each corridor was thoroughly scrubbed and cleaned at night by the building maintenance crew so as to remove surface coatings. Slipperiness tests were made the following day on each of the cleaned corridors with both rubber and leather test heels and under both dry and wet conditions.

Each corridor was then given a specific waxing treatment at night and again tested the following day. All of the waxes were of the water-emulsion type. Two coats of waxes *A*, *B*, and *C* were applied and the floors machine polished after each coat. Three coats of wax *D* were applied and the floor machine polished only after the last coat.

Measurements were repeated on each of the corridors at various time intervals in order to determine what changes occurred in the slipperiness of the waxed floors when exposed to normal maintenance and traffic. The maintenance consisted in dry brushing and machine polishing the floors at the end of each work day. In figure 6, only work days were counted as days of exposure.

The relative order of the antislip coefficients obtained with the pendulum, impact-type slipperiness tester for the different corridors correlated very well with their relative slipperiness as actually experienced. Two of the asphalt tile corridors when freshly waxed (waxes *A* and *B*) were decidedly slippery to leather footwear, even when dry. One (Wax *A*) became definitely less slippery with time, whereas the other (wax *B*) improved only slightly. Under dry conditions, the antislip properties of the other two corridors when freshly waxed (waxes *C* and *D*)

* Statistical measure of scattering.


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**No. 176½**—All Chrome Leather—14 inches long—Clute pattern—Inside seams. Has leather reinforcing strap over thumb seam, reinforcing patch on back of left glove for additional protection and patch on gauntlet at base of palm.

**No. 185 L Special**—All chrome leather 14" glove—fully lined—Gunn pattern—One-piece back—Inside seams, welted. Wing type thumb permits extra wide reach, or span across palm without strain on thumb seam. Very comfortable to wear.

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GARDWELL Protective Clothing comes in all desired materials—chrome leather, Underwriters' Grade Asbestos, Synthetic, etc.—with full cut patterns, double sewn seams, rivets, etc. to guarantee long wear—and backed by 24 years of experience.

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were satisfactory with leather footwear. All the corridors when dry gave very good traction with rubber footwear both before and after waxing.

Higher antislip coefficients were obtained for the waxed asphalt tiles than for the untreated tiles when tested with a rubber heel under dry conditions. With a leather heel the opposite was found except for one wax (wax *C*). Under wet conditions all of the corridors would be considered hazardous for both rubber and leather footwear and especially so when waxed.

In general, the antislip properties of the waxed asphalt tile corridors improved with continued exposure to dry maintenance and normal traffic. Measurements made on the corridors after they were scrubbed with plain water and machine polished were too varied to warrant any generalized conclusions.

The results of these tests, considered in relation to slipperiness as actually experienced, indicate that a slippery condition does or does not exist, according to whether the measured coefficient is less or greater than 0.4.

Slipperiness measurements, although significant, may not in themselves afford an adequate basis for selecting the most satisfactory commercial floor treatment. Other factors, such as durability, appearance, ease, and cost of maintenance, and the requirements of existing specifications, would also need to be considered in determining the suitability of any floor finish.

Pictures, drawings and material by courtesy of the Journal of Research of the National Bureau of Standards.


**New Products for the New Year**

*Fire Extinguisher Invention*
*Industrial Records*
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*Silicated Paint*
*Ladder Jacks*
*Non-Slip Paint*
*Heavy Duty Glove*
*Adjustable Climber*
*Gas Flow Meter Unit*

**See pages 65–66**

Mobile shoe store brings safety shoes to industry. Inset shows truck interior. Alarm system protects store.

## Protection for Safety Shoe Truck

COMPLETE protection for a shoe store on wheels is the latest assignment for Babaco Siren Burglar Alarm Systems. This unique service is provided for Industrial Safety Service, Inc., a Pittsburgh firm merchandising Hy-Test Safety Shoes for industrial use.

Presented with the problem of making their product readily available to industrial workers throughout a wide trade area, Industrial Safety Service has introduced a trailer completely equipped as a shoe store. The mobile shoe store travels throughout the area, servicing workers right at the plant. As the photograph shows, the trailer interior is lined on both side walls with standard shoe store shelving, seats and stool are provided, and even the "store's" office and records occupy a position on the elevated portion forward. Customers enter through the rear double door.

Theft of either the trailer or its valuable stock of shoes is prevented by the Babaco system. All doors are wired and connected with Babaco's sealed-load device so that attempts at entry en route or at any time the "store" is not open for business will set off a siren. The trailer is also equipped with Babaco's "Parker Alarm" which sets off the siren if an attempt is made to move the parked trailer.

## ASA Code For Gray Finishes

FOUR shades of gray for use in painting industrial machinery and equipment are recommended in a proposed standard for Gray Finishes for Industrial Apparatus and Equipment now being circulated for comment and trial use. Although the standard does not recommend that gray necessarily be used, it does suggest that when industrial apparatus is painted gray the use of these standard shades will help in matching the shade desired and in providing better color harmony.

The four standard grays are described according to number and Munsell notation since it is expected that for industrial use the exact identification will be desired. For the convenience of individuals, however, color chips have been prepared so that anyone interested can visualize what the color described will look like on his machines. These color chips can also be used in making a quick visual check or comparison of the colors. It recommends tolerances for both the secondary standards and the spectrophotometric work. In addition it makes recommendations as to gloss and texture.

The four standard grays recom-

mended are: Light gray; medium light gray (or standard machine tool gray 7-B); medium dark gray and dark gray.

The Proposed American Standard Gray Finishes for Industrial Apparatus and Equipment, Z55, was prepared by a committee of 16 national organizations, producers and users of industrial equipment and producers of industrial finishes, and four individual members widely recognized as authorities in the use of color. The committee is sponsored by the Mechanical Standards Committee under the procedure of the American Standards Association.

## Foreman's Booklet

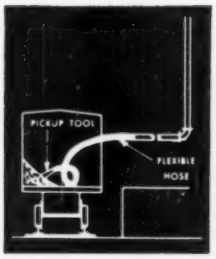
A NEW pocket size booklet "A Short Course in Human Relations" has been prepared for distribution by the Dartnell Corp. of Chicago.

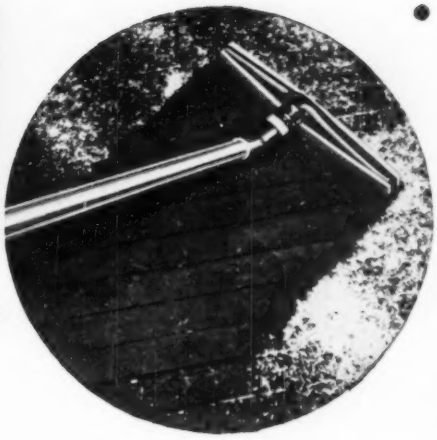
Written by F. C. Minaker, Editor of Industrial Relations Service, the booklet was prepared for the purpose of giving the foreman a vest pocket collection of ideas aimed at improving what is usually a weak point—the ability to get along with others.

The material treats in interesting narrative form the various types of leaders such as "the hardboiled foreman", gives specific hints on the art of praising, the use of correct tone of voice, taking workers into confidence, how to get along with others, how to give a reprimand, the handling of the grievance problem, conducting an interview, etc.

A large section of the booklet is devoted to the role of the foreman as a key man in accident prevention and discussing the need for securing cooperation of the rank and file in this all important endeavor.

Copies of the booklet with company names imprinted on the back are available at special quantity prices upon application to The Dartnell Corp., Ravenswood & Leland Aves., Chicago 40, Ill.

CONVEYING OUNCES OR TONS WITH SPENCER VACUUM

Pneumatic conveying is an economical and dustless method of moving bulk material by the tons. Used for unloading freight cars or boats, transferring material from one part of the plant to another or in many other ways. Usually the equipment is permanently installed with automatic dumps on the separator for discharging the material into storage bins or hoppers. Portable machines capable of handling up to 4 tons per hour also available and can be moved up to the side of a gondola freight car for disposal of the material collected. Any type of free flowing materials can be handled.

The following are only a few of the different kinds of material handled by Spencer pneumatic conveying systems:

Ammonious Beryllium Fluoride
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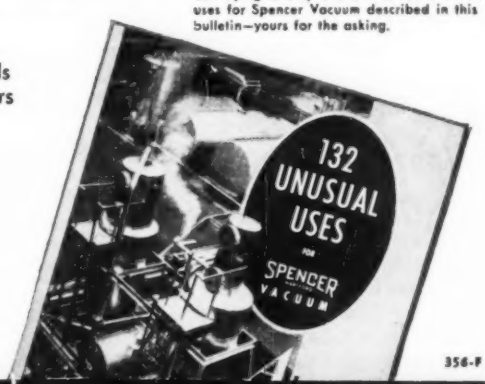
Chemical Powders
Cinders
Dried Beans
Food Products
Lamp Black
Lead Dust
Metal Chips
Oils
Rice
Sand
Silica Sand

Conveying is only one of the 132 unusual uses for Spencer Vacuum described in this bulletin—yours for the asking.




356-F

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Any other spike, if made with only one kind of metal, will wear as dull as the full thickness of the spike.

Dull spikes are a hazard. Constant inspection and sharpening is expensive and does not fully eliminate the danger. SAFE-HI stops both the expense and the hazard.

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## Fluorescent Lamp Disposal Booklet

INCREASING cuts and infections caused by improper disposal of old and used fluorescent tubes and mercury vapor lamps has prompted the publication of another safety booklet by the Accident Prevention Department of the Association of Casualty and Surety Companies. Titled "Your Guide to Safety When Disposing of Fluorescent and Mercury Vapor Lamps," the pocket-size booklet points out inherent dangers in the tubes and directs their safe disposal.

Aside from the hazard of breaking glass, the safety guide says, persons disposing of the lamps may be endangered by inhaling even small quantities of the toxic materials inside the tubes. In addition, if the phosphor powder clinging to the pieces of broken glass should get under the skin, it prevents healing of the wound. Copies of the new safety booklet are available through member companies of the Association.

## Fire and Safety Courses at N.Y.U.

GRADUATE courses in Fire Protection Engineering and Safety Engineering are being offered at New York University. Registration will be held February 3 and 4, 1949, 6:30–8:30 P.M. at South Hall, University Heights.

The courses are primarily designed in order that graduates will be fire and safety conscious in the practice of engineering. Mr. Edward J. Kehoe, U. S. Atomic energy Commission, conducts the Fire Protection Engineering Course on Monday evenings. The Safety Engineering course on Thursday nights is given by Mr. Henry A. Cozzens, Jr., Industrial Consultant.

Further information may be obtained from the Assistant Dean, Graduate Division, College of Engineering, New York University, University Heights, New York 53, New York.

## Dry Chemical

*(From page 11)* fires in electrical equipment) and in some cases Class A fires (fires in ordinary combustibles).

To control the throw of dry chemical and to enable persons to combat fires at a distance with the device, the expelling power of carbon dioxide has been harnessed. Methods of releasing carbon dioxide to provide pressure for expelling the dry chemical vary with the manufacturer. In all cases dry chemical fire extinguishers should be checked and recharged after use.

Several types of nozzles now being manufactured give dry chemical fire extinguishers diversified fire-fighting ability. One nozzle discharges the agent in a widely fan-shaped fashion at a low velocity allowing maximum coverage in killing fires involving spilled gasoline. Another nozzle offers a long straight stream for fighting overhead fires or fires in electrical equipment. Both streams of dry chemical afford a degree of

safety for the fire-fighter by producing a heat shield which reduces the high temperature created by fire.

In tests conducted by the Factory Mutual Laboratories, dry chemical was found to quickly suppress flash fires in textile lints, reducing such Class A fires to a smoldering state. For such use, it is recommended that cartridge expelled water extinguishers or soda and acid devices be used to complete extinguishment of smoldering or subsurface fires.

Maintenance of dry chemical fire extinguishers require that carbon dioxide cartridges be weighed twice a year and sealed refills should be purchased from manufacturers and partially used refill containers should be tightly sealed so that contents are not exposed to atmosphere.

Comparatively speaking, the dry chemical fire extinguisher is still young in the industry. Manufacturers of approved fire extinguishers are improving on existing dry chemical extinguishers and some of them are planning on greater production in the near future.

Pictures by courtesy of the Fire Protection Institute.

## W. E. Mallalieu Gets Award

MR. W. E. MALLALIEU, who has been General Manager of the National Board of Fire Underwriters since 1910, was awarded the annual Gold Medal of the General Brokers' Association at the association's annual dinner recently at the Hotel Astor. The medal is awarded each year to the person who has rendered the most distinguished service on behalf of the insurance business. The choice is made by an advisory committee made up of previous medal winners.

Mr. Mallalieu has long been recognized as one of the nation's outstanding leaders in the field of fire insurance and fire protection. He joined the National Board of Fire Underwriters as an electrical inspector on December 9, 1900, when the complete staff numbered just six people. The great period of expansion began a few years later, and Mr. Mallalieu was appointed General Manager in 1910.

Under his guidance, the work of the National Board has touched every aspect of fire prevention and fire protection, and the organization has rendered many special services to the fire insurance business as well as to the public.

Public services of the National Board include periodical inspection of fire fighting facilities in most of the nation's cities, research in fire fighting techniques, investigation of arson, adjustment of catastrophe losses, recommendation of model building codes and other regulations to insure safety and education of the public in methods of preventing fire.

The National Board also maintains records and statistics which are widely used by fire insurance companies, insurance departments and fire marshals.


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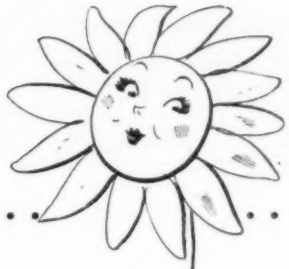

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## Safe Use of Explosive Power Tools

EXPLOSIVE power tools have recently claimed the life of a second California worker. Early in 1948 the first fatality involving such equipment was reported to the Division of Labor Statistics and research. In that instance a metal stud propelled from the muzzle of an explosive powered tool deflected from a concrete ceiling, striking the tool operator in the head inflicting fatal injuries. Another similar accident has just claimed the life of a worker who was attempting to drive studs into a concrete wall from his position on a ladder jack scaffold. In this instance the steel stud was deflected from the concrete wall with such force that it penetrated the skull of the operator.

According to the California Department of Industrial Relations, close supervision and adequate training must be used with these tools to avoid the possibility of serious accidents. It is especially important that the use of such tools be limited to operations not requiring the assumption of difficult or awkward positions, since such conditions are likely to result in the discharge of the tool before the muzzle is accurately placed at right angles to the surface into which the stud is to be driven.

The protective shields with which such tools are furnished should not be removed. Other methods of fastening studs should be adopted in cases where the shield interferes with the proposed installation. Under no circumstances should the tool be used without the protective shield. This shield tends to prevent deflection of the stud in two ways. In the first place, the shield prevents the discharge of the tool when it is not at right angles, or nearly so, to the surface on which it is being used. In addition, the shield serves as a guard to prevent the ricochet of a deflected stud or the flying of wall particles.

## Safety Rides the Rails On the Santa Fe

*(From page 17)* on all cars operates as one complete unit after the train is made up

3. Prior to shoving a train into the depot, a test is made known as "standing air test." It reads as follows:

"Operating Rule 943. When engine has been coupled on and gauge shows a sufficient pressure in brake pipe, the inspector or trainman making the test will request the engineman to apply the brakes, and will then go to each car and observe the piston to see that each brake is set. When last car is reached, if the brakes are set properly, he will give signal to the engineman to release the brakes and will then examine each car to see that the brake releases. On arriving at the engine he will report to the engineman the number of brakes in good order and working, also the number of brakes cut out or

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inoperative. This test must also be made when changing crews or engine handling brakes on any train, except as provided in Rule 948."

When this test is made by inspectors, air brake clearance card, Form 1184, will be prepared by them and delivered to conductor and each engineman, who must each have a copy before departing.

This test must also be made when changing crews or engine handling brakes upon any train, except helper engines attached subsequent to such test, in which case test shall be made as per Rule 875."

4. And still another test is made. This test is known as "within 500 feet test." It reads as follows:

"Operating Rule 955. When rear end valve is used to control backward movement of as passenger train, the conductor or yardman will, within 500 feet after such movement has started, make a sufficient reduction of air to insure that the brakes are operative. The handle of the engineman's brake valve should be kept in running position. If the reduction is not noted by the engineman within this distance, he must stop the train and ascertain the cause."

5. When the train is set in the depot, the yard engine is uncoupled and the diesel road engine placed on the train. Another test is again made in order to determine if the road engine is able to control the brakes. During this procedure, a final check is made of the condition of the cars by the mechanical department inspectors at the depot. If the brakes function properly and the equipment is satisfactory, the train is then given permission to depart on schedule.

Smooth functioning experienced crews uncover the smallest defect, and repairs are instantly and efficiently made. Additional inspections of all power units are required every three months and each inspection requires a more extensive check-up of the parts than the previous one. Much of the inspection involves the use of Magnafluxing, Reflectoscope and similar equipment to detect hidden fractures that present incipient failures.

What has been said about the inspection of cars also applies to the examination of the 6,000 horsepower diesels. One item in particular stood in sharp focus, namely, that on the arrival of the diesel in the depot, mechanical inspectors are there to immediately check for temperature of the motor bearings. This precaution is taken as overheated traction motor bearings may cool off between the time the locomotive arrives and is returned to the roundhouse for inspection. What are some of the additional items of inspection on locomotives over and above that which are required on the cars?

1. The automatic pedal control is thoroughly tested to see that it is functioning properly. (If, for any reason, the engineer lifts his

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foot from the pedal control, the train comes to a complete stop.)

2. The triple air valves are tested and cleaned.

3. The automatic train control mechanism is thoroughly tested.

4. The warning horns and headlights are thoroughly gone over.

5. Other mechanics and electricians swarm over this 6,000 H.P. giant to make sure that all mechanical and all electrical parts are in good order and functioning properly.

6. Old removed parts are dismantled and carefully inspected by all modern devices available to assure that when the motor, generator or engine is rebuilt, it will be as good as new.

At the end of each run, cars and locomotives are thoroughly washed and readied for the next run. The many unseen hands are in a large measure responsible for the high degree of perfection at which these fast trains operate. Although the yard air tester is never heard of by the traveling public, he deserves a vote of thanks for a job well done day in and day out.

### The Iron Path

Hundreds of workmen maintain the right-of-way. Who are these men and what do they do? They are section men, carpenters, iron workers, painters, signalmen, masons and their helpers—the men who build the new road beds and maintain the old—men who lay the ties and tracks—men who keep the signal system in order—repair the damage done by storms and washouts—paint the bridges—keep the tracks free of snow in the mountains and sand in the deserts. Each man is a specialist in his own right. In addition, specially trained chemists and technicians constantly analyze timbers and ties, rails and road beds, bridges and abutments to see that the factor of safety is sufficient.

Santa Fe has kept pace with the ever-increasing faster schedules. How?

1. More rigid and better riding track—by using larger and longer ties, heavier rails, heavier joints and larger tie plates. Many are the improvements that have been made in track structure.

2. Rail flaw detectors perform the safety function of locating defects so that repairs can be made promptly, before the rails become hazardous.

3. Much has been accomplished in this past decade on curve reduction and improved track alignments. Such improvement of alignment provides more comfort for passengers and results in less wear and tear on equipment as well as track structure.

4. A thorough and detailed bridge inspection is made once a year by division officials. In the interim, however, an assigned bridge inspector makes his inspection once a month. It is interesting to note in 1946 Santa Fe acquired electrical instruments for use in determining live load stresses in members of older steel bridges. The recorded stresses reflect the

effects of bridge, track and engine conditions.

5. For road-bed stabilization, Santa Fe pioneered the method of combatting water pockets under track by pumping into the road bed a grout composed of blow sand, cement and water and a small amount of emulsified asphalt. This process, by filling the voids with a lean mixture, stops the tendency of plastic clay to flow under pressures exerted by trains moving over the track and has the effect of stabilizing the road bed.

6. Another fine safety measure that this railroad follows is known as controlled cooling of rails—a process which eliminates the transverse fissures in rails.

These are some of the more important reasons why the new streamlined trains run on a faster schedule, covering great distances —safely and with top efficiency.

*(To be continued in the February issue of Safety Engineering.)*

Pictures by courtesy of the Atchison, Topeka and Santa Fe Railway.

# Matches Tell Their Own Safety Story

ONE of the finest safety records in the country has been compiled by a company engaged in what is ordinarily considered a hazardous operation. The Ensign-Bickford Company, with plants at Simsbury and Avon, Connecticut, makes safety fuse, blasting accessories, pyrotechnical devices and other products containing explosives. Despite the continuing presence of potentially dangerous ingredients the company has not had a fire or a casualty in 43 years of operation at the Avon plant, and 30 years at its Simsbury plant.

J. K. Brandon, president, believes that his company's perfect safety mark was scored because of rigidly enforced and constantly emphasized controls. One of the principal media used to repeat warnings to workers, Mr. Brandon said, is the book match which carries the words "Never Carry Matches Into The Plant."

"We have match houses, built along the general lines of bird houses, at plant entrances," Mr. Brandon said. "Workers empty their pockets of matches as they enter, placing the lights in the houses. As they leave at night each worker receives a book of company matches with the warning printed on it.

The match company "has been supplying us with this type of safety program match for about ten years, and our continued use is our endorsement of the worth of book matches as a means of prevention of fires and accidents."

A safety committee of employees makes unannounced checks from time to time to see whether the rule on matches has been violated.

"But," said Mr. Brandon, "since we adopted the current system of depositing matches in the special houses and using match covers to preach safety we have had no known violations."


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At the same time, they're flexible, comfortable to wear, don't have to be broken in. The wool lining keeps out heat, keeps hands cool. Jumbo size makes them easy to put on, take off, gives hands plenty of ventilation. Palm seam and heel of hand have extra reinforcement.

They are well made one finger mitts. Manufactured with 2 inch cuff (No. 14883), 4 inch gauntlet (No. 14730), 6 inch gauntlet (No. 14844). Also available in glove and mitten styles. Sizes for both men and women.

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# SNOW-MELTING HIGHWAYS

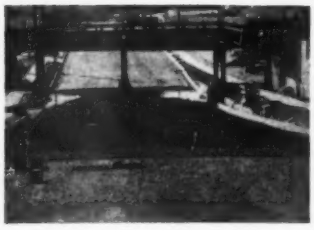
THE dream of every motorist and every highway engineer—a snow-melting highway—is about to be opened for use in the town of Klamath Falls, Oregon. In the first application of radiant heating principles to a public road, the highway will be heated in bad weather by hot water from an underground spring circulated through a network of welded wrought iron pipe laid in the concrete. Four lanes wide, 450 feet long with an eight per cent grade, this dangerous road area is designed to remain clear and skid-free in all weather by automatically melting up to one inch of snow or one-tenth inch of ice per hour.

The stretch of all-weather heated pavement is on the Dalles-California Highway leading into Klamath Falls from the north. It passes under the Southern Pacific Railway viaduct and a few hundred feet farther crosses an irrigation ditch, thus necessitating a grade two or three per cent steeper than would be normally used.

Work was started on the road late last spring after a ten-inch well had been drilled which struck a good flow of hot water at 390 feet. G. S. Paxson, bridge engineer for the Oregon State Highway Commission who developed the idea for the winter-proof highway, has announced that the stretch would be completed and in operation by January 1.

The hot well-water itself is not run through the roadway piping. Instead, a coil of two-inch pipe is submerged deep in the well-water, which tests at 190 degrees, about 20 degrees below boiling temperature. In effect, the well serves as a boiler. A pump sends ordinary water and anti-freeze through the well coil, where it is heated or reheated to not less than 160 degrees.

A two-inch pipe runs from the well to the pavement, and then parallel to the road for a distance of about 400 feet. In the pavement slab are embedded 15,000 feet of three-fourth-inch wrought iron pipe, made up into one grid for each of a series of 30-foot road panels. Each of these 15 panels is connected with the two-inch water main by valves. The pipe carried a coating of asphalt before being laid in the concrete. Wrought iron was used in the installation because of its resistance to corrosion and because its coefficient of expansion is virtually the same as that of concrete, thus keeping the bond and minimizing the danger of cracking the concrete. The two-inch main and the series of grids comprise a closed circuit through which heated water is pumped, the valves insuring an even flow of water through each grid. Thus the whole eight-inch slab of road concrete is warmed to snow-melting temperature.



These wrought iron pipe coils will keep a steep stretch of highway in Klamath Falls, Ore., clear of ice and snow this winter. Water heated in a natural spring circulates through the pipes.

The pump, thermostatically controlled, automatically begins to circulate the water when air temperature drops to freezing and continues to operate until the temperature rises above freezing. Another pump draws water from the well since it loses its heat value as the cool water flows from the road through the heat transfer coils. Hot water then bubbles up from the earth back into the well.

### Similar Highways

This type of heating, with a boiler used to heat the water, has been increasingly popular in residential, industrial and business

construction. During the past few years it has been brought outdoors in many installations to winter-proof sidewalks, airports, private driveways and filling station areas. A private road was opened last winter at Belmont, Mass., near Boston, and the American Cyanamid Company plant at Bridgeville, Pa., has a 600-foot long, two-lane driveway protected by embedded wrought iron pipe coils.

Picture by courtesy of the A. M. Byers Co.

# Ultrasonic Testing

IN ENTERING the field of supersonic research, the United States Testing Company, Hoboken, N. J., has announced the completion of arrangements to take over in specific fields the research and development activities of the Crystal Research Laboratories of Hartford, Conn. This latter company developed the Ultra-Sonorator, the first laboratory apparatus for utilizing commercially the sound waves in ranges above those audible to the human ear. The deluge of inquiries for possible use of high frequency sound waves in various types of manufacturing necessitated separation of these potential developments from the actual production of the apparatus. The United States Testing Company was selected as the logical place to handle these inquiries and carry on research projects in this field.

According to officials of the United States Testing Company, the studies will involve "ultrasonics" as differentiated from "supersonics." While the two terms have been used interchangeably, men in this field reserve ultrasonics to describe frequencies of vibration or processing, while supersonics refers to speed of motion, namely speeds above the speed of sound.

### Uses of Ultrasonics

Ultrasonics have already been used commercially for detecting flaws in metals, plastics and other materials by sending sound waves through the mass and charting the time of the rebound. The Sonorator, as developed by the Crystal Laboratory, utilizes the terrific vibrations set up by sound waves of over 200,000 per second and up to 1,500,000 per second for mixing all types emulsions, destruction of bacteria and other uses of tremendous significance. The vibrations are so violent oil and water have been mixed into a perfect solution.

The potentialities of this field of science are so vast and have captured the imagination of American producers to such an extent, the Crystal Research Laboratories will possibly divide its activities to other research organizations specializing in specific utilizations. For example, ultrasonic laundering of clothes is a possibility. Sterilization of milk and other foods is another. In laboratory tests sound waves have reduced the bacteria count of milk to eight per cubic centimeter, while a count of 30,000 indicates a high standard of purity for pasteurized milk.

Scientists have been known to treat planted seeds with ultrasonic waves and have reported sensational increases in yield. Dr. Raymond H. Wallace, a University of Connecticut botanist using the Sonorator for the past two years in agricultural experiments, repeated this work and extended it to new applications and has obtained many favorable results. Grains treated a brief period of time with 400,000 vibrations per second definitely showed rapid germination and growth. Sunflower seedlings treated with ultrasonics produced entirely different flowers and leaves and reached full growth within 3 weeks.

While the science of high frequency sound waves has been known for more than three quarters of a century, it remained in the laboratory until World War I, when it was used for submarine detection. Just previous to World War II, the possibilities became apparent and research was thrown into high gear. Several means of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utilizing high frequency sound waves have been created: the siren which uses air at high pressures to produce vibrations, the crystal type of ultrasonic unit which uses electricity and takes advantage of the peculiar ability of quartz crystals to transform electrical energy into mechanical vibrations and the metal rod type of ultrasonic which uses a metal rod instead of a crystal to produce vibrations.

These three methods have already demonstrated their possibilities for dissipating fog over an air field, recovering carbon black and soda ash in the smoke and fumes from plant chimneys, aging whiskey, increasing potato yields 40 to 50 per cent, mixing mayonnaise, peanut butter, face cream, paint and chemicals and opening garage doors by emitting a silent blast on a whistle whose vibrations start a motor that moves the door and automatically turns on the garage lights.

The United States Testing Company will merge the ultrasonic laboratory with its other integrated operations covering textiles, biology, chemistry, mechanical and electrical engineering, leather dyestuffs, etc., so as to furnish a complete range of potential uses, in the special phases for which the new laboratory is designed.

## City Code Requires Luminous Signs

The building code of the City of Hartford, Conn., requires that all public buildings be equipped with exit signs which will continue to glow for at least one-half hour after lights fail or are cut off.

Solve Your 1949 Problems NOW!

One or more of the Free Bulletins & Catalogs listed on page 71 may be the lead to a happy and prosperous New Year.

## N. D. Mitchell to Head Fire Protection Section, Nat'l Bureau of Standards

NOLAN D. MITCHELL, prominent in architectural and engineering fields, has been appointed Chief of the Fire Protection Section of the National Bureau of Standards, where he will direct further research for the Building Technology Division on problems of fire-resistance in relation to the design and construction of buildings and building materials.

Mr. Mitchell has been on the staff of the National Bureau of Standards since 1922 and has made a number of important contributions in the fire protection field, an outstanding example of which is his investigation of the control of airplane hangar fires by the automatic application of water. His research on the fire-resistant properties of structural materials, such as metal-framed and wood-framed interior partitions and columns protected by gypsum, has led to the determination of the effects of fire and the time in which a wall, floor, or other structural element will retard the spread of fire; improved methods of temperature measurements; and the standardization of fire tests. He has also conducted extensive investigations of automatic fire detecting and extinguishing devices.

Mr. Mitchell has represented the Bureau on a number of technical committees, such as the American Standards Association's Sectional Committee on the Building Exits Code, Standards for Safety in the Construction Industry, and Standards for Grandstands, Tents, and Places of Outdoor Assembly. He has served as a member of several other technical committees of national scope, including those on Building Regulations for Reinforced Concrete, Building Code Requirements for Fire Protection and Fire Resistance, Building Code Requirements for Chimneys and Heating Appliances and Methods of Fire Tests of Building Construction and Materials.

## 1000-DAY CLUB

ONE of the activities of the National Lime Association is The Thousand-Day Club. This Club was adopted on May 12, 1937 by the Board of Directors of the National Lime Association. It provides that any lime plant which has completed 1,000 days or more of accident-free operation shall be entitled to receive an appropriate certificate of membership in The Thousand-Day Club. This activity is conducted in cooperation with the U. S. Bureau of Mines.

At a recent Operating Division Meeting of the National Lime Association held at The Palmer House, Chicago, Illinois, the Thomasville, Pennsylvania Plant of The J. E. Baker Company was awarded a Thousand-Day Club certificate. Presentation was made by William T. Harvey, Jr., Chemical Engineer, National Lime Association, to John A. Seehrist, Superintendent of the Thomasville Plant. During presentation it was revealed that the Thomasville Plant has worked 1,965 days or a total of 425,000 man-hours without a lost-time accident. It was also reported that The J. E. Baker Company has been enrolled in the National Lime Association Annual Safety Competition since its beginning in 1935. During this thirteen-year period they have received safety certificates ten times. It is the eighth company to merit a Thousand-Day Club certificate.

Following presentation of the membership certificate, Mr. Seehrist briefly outlined his company's safety policy. The J. E. Baker Company stresses its safety program by thorough indoctrination of new employees and constant reminder to "old hands."

### Wire Rope

*(From page 29)*

have a result that points directly to old man trouble.

Slings, the same as any other piece of modern equipment, have gone through an evolution. Manufacturers of wire rope slings have made great strides in research, engineering, design, and construction. Their engineers have gone into the field, surveyed jobs on which slings of all kinds were used. They have built slings in their laboratories, tested them, and torn them to shreds for only one reason: to furnish you with better, safer—and cheaper-to-use—wire rope slings. They have standardized on certain constructions, each with special characteristics for certain lifting jobs you have. Their slings offer uniformity throughout, including breaking strengths. One manufacturer even warrants the rated capacity of its wire rope slings which are proof-tested under load at the factory before being shipped. A further step is the identification of each sling with a tag showing the rated capacity.

If there is any doubt in your mind about the safety or service cost of the slings you are using, take a look at them right now.

Pictures by courtesy of the American Chain & Cable Co.

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Those dangerous, slippery floor areas can be swiftly changed to safe, sure-footed places with FOOTHOLD Safety Tread Cleats. These tough abrasive cloth cleats are "Sandpaper rough," waterproof and resistant to oil, grease, alkalies and mild acids.

Installation is fast. No tear-ups or tie-ups. FOOTHOLD Safety Tread is cemented to any smooth, clean surface and can be used immediately after installation. See for yourself. Let us install a free sample cleat in a danger area in your plant. Write us today.

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Your workers will do a better sharpening job if they can see better. "Flud-Lite" Eye Shields give them 30% more visibility . . . and protect eyes with full 4" x 6" glass shielding . . . safety glass on top, ordinary glass underneath. Adjustable to suit workers' position and convenience. But cannot be moved to off-guard position without dismantling. Easily removed and installed bayonet type lamps with supported filament. Available for 115 or 220 volts. Write for illustrated folder. Stanley Electric Tools, 528 Myrtle Street, New Britain, Conn.

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USE THEM OVER AND OVER AGAIN
We are saving thousands and thousands of dollars a year for nationally known companies by reclaiming work gloves of all types; leather, cotton, asbestos, etc. IT COSTS NOTHING TO FIND OUT. TRIAL ORDER FREE!
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## Television in Cars? NO!

THE Greater New York Safety Council took a firm stand recently in favor of television—almost anywhere except in an automobile.

"There are enough unnecessary deaths on our highways without adding television as an accessory to the slaughter," said Edward A. Fullarton, chairman of the Council's commercial vehicle section. Mr Fullarton announced that the section's executive committee had voted to take all measures possible to oppose installation of television sets which could be operated or viewed by drivers of cars, following reports that a few such installations had already been made. He indicated that the group might not be averse to installations which could be seen and operated only by backseat passengers.

Declaring that television in a car was "altogether different" from having a radio set behind the panel, Mr. Fullarton cited both the visual distraction of the driver in the case of television and the need to keep adjusting the setting as the car changed location and direction.

"A television set in an automobile within the driver's vision is a menace not only to the driver and passengers of that car but to the lives of other motorists as well," Mr. Fullarton asserted. "It is horrible to think what would happen on our roads if drivers had their eyes or minds on television."

## Quarry Safety Award

MARQUETTE CEMENT MANUFACTURING COMPANY recently received three Certificates of Achievement in Safety from the U. S. Department of the Interior, Bureau of Mines, in recognition of the outstanding record of safety in operations at Marquette quarries in Oglesby, Ill., Cape Girardeau, Mo., and Earlham, Ia. To achieve this distinction in national safety competition, Marquette men at the Oglesby quarry performed 126,157 man-hours of work without a lost-time accident in 1947. The record of the Cape Girardeau quarry was 63,622 injury free man-hours during the same period. Marquette Earlham quarrymen hung up a record of 44,960 consecutive man-hours of safe work in 1947.

In a letter accompanying these certificates James Boyd, Director of the U. S. Bureau of Mines, said: "The attainment of this injury-free record was possible only with the full cooperation of all employees and officials in a well-designed accident prevention program. The achievement of a position of national leadership in accident prevention is an accomplishment of which you and your employees may take great pride. Kindly extend my heartiest congratulations to your men for the excellent past record and best wishes for its continuation."

## Is the Driver Always Wrong?

HERE are some interesting clues to the causes of fatal traffic accidents from a recent report of the New Hampshire Motor Vehicle Department:

60 per cent of the drivers lived within 25 miles of the accident.

None of the drivers had physical defects.

80 per cent of the drivers had not been drinking.

The highest speed recorded was 31–40 miles per hour; and 60 per cent of the cars were doing 30 or less.

And, according to The Street and Traffic Safety Lighting Bureau which furnished this information, 60 per cent of the fatal accidents occurred during darkness and two-thirds of these night mishaps were on streets without lights.

The Bureau says its studies indicate that providing adequate visibility by proper street lighting cuts fatal night accidents an average of 73 per cent.

Women employees at Mine Safety Appliances Company received boxes of roses as the plant marked its completion of an entire year without a lost time industrial accident. The men received cigarettes.

## MSA Employees Get Safety Rewards

EMPLOYEES of Mine Safety Appliances Company have completed an entire year without a lost-time industrial accident, it was just announced by the company.

To mark the occasion, each male employee was presented with a package of cigarettes by his department foreman and female employees received roses. The gifts were accompanied by congratulatory cards.

Safety Director H. F. Idzkowsky said that since Nov. 13, 1947, an average of 1138 employees worked 3,119,365 manhours without a lost time accident. At the Callery, Pa. plant of the company employees have worked 1,137,076 manhours since August, 1944, without a single lost time accident.

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## What Type of Industrial Injury Is the Most Costly?

PERMANENT Total Disability, according to the experience in Illinois. The Industrial Commission of this state reports the payment of $195,266 for settlement in 1947 of 35 permanent total disabilities, which averages $5,579 per case, as compared with $3,728 average payment for the settlement of 346 fatalities during the same year.

## Color Reduces Accidents in N. Y. Transit System

DURING the past eighteen months accident frequencies among the 38,000 employees of the New York City Transit System have dropped 42.3 per cent. This has been accomplished in part through the application of a color code devised by Faber Birren, New York color consultant, and carried out in conjunction with the accident prevention program of the Board of Transportation. Accidents have shown a steady decline, with recent months being the lowest on record.

This is one of the most extensive research studies yet undertaken to measure the value of color in industry. In executing the plan, labor permission was granted to shop workers to paint their own machines and equipment. The entire job of painting was done within a short period so that the benefits of color could be quickly applied.

The use of bright colors in all shops—designed to mark hazards and not for decoration—has proved unusually effective in dramatizing the importance of good safety practice.

In applying the 42.3 per cent reduction to government accident-cost figures, the annual saving is equivalent to about $500,000.00 in compensation costs, medical care and lost production. In addition, of course, human welfare has been effectively safeguarded, numerous major and minor accidents having been prevented.

The Color Code, published in 1944 and accepted in part as a national emergency war standard in 1945, has been widely employed in industry. Its use is mandatory in all shore establishments of the U. S. Navy. Significant in the New York City experiment is the fact that the code was applied in complete detail under able supervision. The "before" and "after" benefits of it are therefore quite apparent as far as statistics go.

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**SELF-POWERED TELEPHONES**

- *SIMPLE TO OPERATE*
- *POSITIVE IN ACTION*
- *EFFICIENT COMMUNICATION*

Only three simple acts are required to put these efficient communications systems into quick, positive action. They'll give you clear, distinct talking and ringing up to 20 miles — will serve you long and faithfullyt without maintenance trouble or expense.

Wheeler Self-Powered Telephones require no batteries or other power supply. Two wires connect the pair of standard size and quality telephone sets. They're compact, tough and convenient. See your jobber or write for descriptive booklet SA-8.

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You play tag with dust when you broom sweep. For dust just resettles to threaten employees' health and plant safety. BUT, Hoffman heavy-duty vacuum cleaning reaches dust and dirt everywhere (even on production operations) and removes it quickly, conveniently into sealed containers.
How long since you checked industrial vacuum cleaning? Today's facts and figures will open your eyes. Hoffman builds heavy-duty portables in 4 sizes. And, all sizes of stationary systems (see cut) to provide multi-sweeper capacity, in several locations at the same time.
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## Measurement of Radioactive Isotopes

RADIOACTIVE isotopes are today finding an increasing number of uses in biological and medical experiments and in the clinical treatment of disease. In all these applications it is important to determine accurately the number of radioactive atoms in a radioactive sample. However, uniform quantitative results can be obtained by different laboratories only through the use of techniques that will yield absolute measurements or by comparison with certified standards. Detailed directions for use of radioactive standards and calibrated samples of radioisotopes issued by the National Bureau of Standards are given in a new 12-page pamphlet entitled *Measurement of Radioactive Isotopes*, now available as National Bureau of Standards Circular 473.

In correlating measurements of radioisotopes in different laboratories, the Bureau distributed identical samples of radioactive materials to approximately 40 hospitals, universities, and similar institutions. The range of values reported by these laboratories varied as much as 80 per cent from the average. Because radioactive radiations are emitted equally in all directions, it is practically impossible to devise detecting equipment to record all of them. This and other difficulties encountered are discussed in some detail in the booklet, and directions are given for overcoming them. Among the topics treated are basic principles of measurement, units, the use of radioactive standards, preparations of working standards, and corrections for change in radioactivity with time.

NBS Circular 473, *Measurement of Radioactive Isotopes*, by Leon F. Curtiss, can be obtained from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C., at a cost of 5 cents a copy.

## Brewers Safety

THE Milwaukee Brewers Safety Committee, organized in October, 1946, has launched a widespread program designed to promote safety and health activities in the Milwaukee brewing industry. This brewery safety committee, first of its kind in the country, is composed of safety supervisors of the six Milwaukee breweries.

Begun late in 1946, the committee's first attack struck at eye hazards throughout the operating plants. An elaborate eye protection program was set up and has since been used in all member breweries, differing only insofar as company policy and plant layout have dictated. The Milwaukee Brewers Safety Committee works in cooperation with the United States Brewers Foundation safety committee, National Safety Council, Milwaukee Association of Commerce, Wisconsin Council of Safety and their own insurance companies. It has been instrumental in creating a uniform application in Milwaukee breweries of safety and health policies, by the exchange of ideas, and is so set up to offer recommendations on safety and health to management. Similar brewery safety committees have been created in New York and Ontario, Canada as the first step toward nation-wide adoption of the mutual assistance idea.

## On the Horizon

LOOKING ahead, the Greater New York Safety Council has announced the dates for New York's 19th annual Safety Convention and Exposition. The event will be held at the Statler Hotel on March 29, 30, 31, and April 1, 1949.

Frank L. Jones, president, announced also the selection of the general chairman and two general vice-chairmen for the event. Fred F. Beik of 172 Ferwood Terrace, Stewart Manor, L. I., is general chairman. Mr. Beik is superintendent of the engineering and inspection division of the Bankers In-

demnity Insurance Company.

General vice-chairman will be Charles R. Fuller of 35-18 213th Street, Bayside, Queens, and M. J. Pitre, of 89-64 Hollis Court Boulevard, Bellaire, Queens. Mr. Fuller is supervisor of the loss prevention department of the Liberty Mutual Insurance Company. Mr. Pitre is superintendent of the engineering department of the Fidelity and Casualty Company.

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## Tampa, Fla.

Tenth Annual Southern Safety Conference, March 6–8. (Hillsboro Hotel.) Braxton B. Carr, secretary-treasurer, 2120 First Ave., North Birmingham 3, Ala.

## Boston, Mass.

Twenty-eighth Annual Massachusetts Safety Conference, March 14–15. Edgar F. Coppell, president-director, Massachusetts Safety Council, 31 State St., Boston 9, Mass.

## Philadelphia, Pa.

Fifteenth Annual Philadelphia Regional Safety Conference and Exhibit, March 15–16. (Bellevue-Stratford Hotel.) Walter W. Matthews, managing director, Chamber of Commerce Safety Council, N. E. Corner 17th & Sansom Sts., Philadelphia 3, Pa.

## Washington, D. C.

Spring President's Conference on Industrial Safety, March 23–25. William L. Connolly, chairman, coordinating committee, U. S. Dept. of Labor, Washington 25, D. C.

## New York, N. Y.

Nineteenth Annual Greater New York Safety Convention and Exposition, March 29–April 1. (The Statler Hotel). Fred F. Beik, general chairman, Engineering and Inspection Division, Bankers Indemnity Insurance Co., 90 John St., New York 7, N. Y.

# THE Future SHOWS

## Toronto, Ont.

Annual Convention Industrial Accident Prevention Association, Apr. 4–5. (Royal York Hotel.) R. B. Morley, general manager, 600 Bay St., Toronto 2, Ontario.

## Columbus, Ohio

All-Ohio Safety Congress, April 12–14. James H. Fluker, Division of Safety and Hygiene, Industrial Commission of Ohio, Columbus, Ohio.

## Pittsburgh, Pa.

Twenty-fourth Annual Safety Engineering Conference, April 19–21. Harry W. Brainard, executive manager, Western Pennsylvania Safety Council, Chamber of Commerce Building, Pittsburgh 19, Pa.

## Baltimore, Md.

1949 Maryland State-Wide Safety-Health Conference and Exhibit. (Lord Baltimore Hotel). June 7–8. Joseph A. Haller, executive chairman, Equitable Bldg., Baltimore 2, Md.

## Chicago, Ill.

Thirty-seventh Annual National Safety Congress and Exposition. (Stevens Hotel), Oct. 24–28. C. H. Miller, Exhibit Manager, National Safety Council, 20 N. Wacker Dr., Chicago 6, Ill.


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This face shield is designed and constructed to withstand extreme hard usage, under the most severe conditions. It combines wide vision, comfort and long life; is recommended as an all-purpose shield; is ideal for use with metal saws, grinding and chipping, pouring babbit, handling magnesium, and a hundred other uses.

The illustration shows the 6-3/16 x 15" non-shatterable large window of .040 thick clear Acetate. Has ventilated fiber visors at the top and bottom, fiber at sides for extra protection and extra strength. The adjustable head band has a friction joint to permit quick raising and lowering. The chin rest firmly holds the shield in place and adds extra comfort.

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# No Atomic Worries for Brookhaven Residents

FUNDAMENTAL atomic research is being stressed in the new Brookhaven Laboratory to satisfy an "urgent need for much more information about this totally new, powerful and awe-inspiring phenomenon," a Yale physicist declared recently. The studies recently begun at Brookhaven will carry over into the fields of biology and medicine, all the pure sciences and technologies will be stimulated and new inroads into research basic to power production will be opened, according to William W. Watson.

Mr. Watson, Professor of Physics and Chairman of the Department of Physics at Yale, discussed the Brookhaven Laboratory on a radio program. The Yale professor, one of the instigators of the Brookhaven project, explained that the Laboratory plan was born in the summer of 1946 when Yale and eight other large universities of the northeast formed the organization called Associated Universities, Inc., a nonprofit corporation to administer an atomic energy laboratory in this region under contract with the federal government.

The idea, he stated, came about when a group of scientists realized that despite the heavy concentration of scientists and industry in the northeast part of the country, no uranium nuclear-energy reactor had been constructed here. Encouragement from a high-ranking Army official led to the creation of Associated Universities, Inc. The Laboratory was constructed at Upton, N. Y. because the War Department was just declaring Camp Upton surplus property at the time. It was sufficiently isolated, well developed and ready for immediate occupancy.

Mr. Watson pointed out that persons residing in the vicinity of the new laboratory are safe. The health hazards are well known and "the protective measures taken are more than adequate," he said. Also, monitoring stations equipped with sensitive detecting devices are placed in the surrounding area to check the intensity of energetic radiations. "No one will be endangered in the slightest from the Brookhaven operations," he asserted.

While no military aspects of atomic energy will be studied at Brookhaven, the Yale physicist stated that "There will undoubtedly be some research directed by the Commission, and of course the military applications stressed at other installations, as well as applied science of all kinds, will benefit from this new knowledge."

Mr. Watson also told of some of the peace-time developments in atomic research. "Using radioactive tracer atoms which can be made in large quantities in a uranium reactor," he stated, "considerable has already been learned about complicated physiological reactions, and some therapeutic results have been attained. In biology, using fruit flies or various microorganisms, mutations have been produced. . . . This is a most promising field of research, for much may be learned about the reproduction and growth of living things."

The Yale professor also described Brookhaven's work in power production. He said that power is to be generated from the heat developed in the atomic pile now nearing completion. After changing hot air from the reactor into steam, the steam will be used to generate about half the electric power needed to run the reactor. He said that the process does not appear to be very efficient, but warned that one must "Keep in mind that this is the initial power development in a new field."


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ASTERMA Protective Cream provides an effective protective covering, safe enough even for the face. It helps prevent contact between the skin and irritating materials which can cause dermatitis.

ASTERMA Protective Cream is *most* economical because of its purity, higher spreading quality and longer life. A little goes a long, long way.

*Send for Sample Today!*

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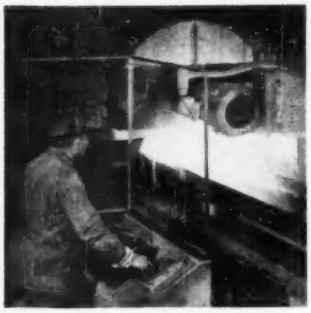
## U. S. Bureau of Mines Award

FORMAL presentation of two U. S. Bureau of Mines awards for outstanding safety records was made to members of Permanente Cement Company's quarry crews recently, at a dinner and ceremony recently at Permanente, California.

This is the third consecutive year that Permanente has won the Joseph A. Holmes trophy, which is given for an excellent safety record during a five-year period. It is the second consecutive year the quarry men have captured the Sentinels of Safety citation, awarded for a perfect safety record during the year.

The cement plant quarry was the only one in California to qualify for the Holmes award, and is one of only two quarries in the state to win the Sentinels trophy, which is sponsored by Explosives Engineers Magazine.



New saw melts steel as it cuts 13 feet a minute.

## Plastic Protection

BUILT to the exacting specifications of United States Steel Supply Company engineers in order to give quicker service to warehouse customers, a new type of saw melts the steel as it cuts 13 feet per minute. The 60-inch blade is operated by remote electrical control, and was designed to make square, burrless cuts across heavy steel sections, such as structural shapes. Its teeth whirr faster than 320 miles an hour at its normal speed of 1,750 revolutions a minute. When the blade makes contact with hard, tough steel, friction generates more rapidly than the material can absorb it. The intense heat melts the surface and the teeth carry it away. A transparent plastic shield assures perfect safety for the operator as the sparks fly fast. This is the first of several high-speed friction saws to be installed at warehouses and is considered the most modern in steel industry.

U. S. Steel Corporation Subsidiaries.

**Free Bulletins & Catalogs are reviewed on page 71 of this issue.**

## Automotive Signal Lights

THE use of more effective "stop" and "turn" signal lights for the nation's nearly 7,000,000 trucks is expected to result from studies made recently by the Society of Automotive Engineers at General Electric's Nela Park, headquarters of the company's Lamp Department. Twenty-odd such lights, of various sizes, colors, and intensities, were viewed by a group of 40 automotive experts at distances up to 500 feet, under both day and night conditions. The group was composed of members of the lighting committee of the S.A.E., and representatives of automobile manufacturers and various state highway safety groups.

Val J. Roper, G-E illuminating engineer, and host to the delegation, said that while final specifications were not adopted at the meeting, it was determined that the lights should be red or amber to the rear, but preferably red, amber or white to the front, that they should be at least four inches in diameter, and that they need not bear printed instructions or arrows.

Roper pointed out that the S.A.E. became interested in promoting adequate signal light standards because of comments made by some safety authorities to the effect that present truck signals in many cases are "inadequate" and truck drivers' hand signals are "ineffectual," especially where truck-trailer combinations are concerned.

One of the chief problems was that of selecting signals having sufficient intensity to be effective in the sunlight, yet not so bright as to be blinding at night, according to Roper. To assist the auto lighting experts in their studies, G-E engineers devised laboratory test equipment in the form of red and amber lights which were adjustable in size from two to eight inches in diameter, and capable of intensities of from 5 to 500 candlepower.

You May Be Good,

BUT

You Could Be Better

and the best job goes to the trained man. With defense spending increasing and production at an all-time peak, there's plenty of opportunity for the trained safety engineer. If you have the perseverance and ability, you can equip yourself by home study. ACCIDENT PREVENTION INSTITUTE offers a complete home study course leading to a degree in Safety Engineering. The course includes basic and advanced engineering, personnel administration, psychology, all phases of accident prevention and other necessary courses.

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*Study a complete course in Safety Engineering*

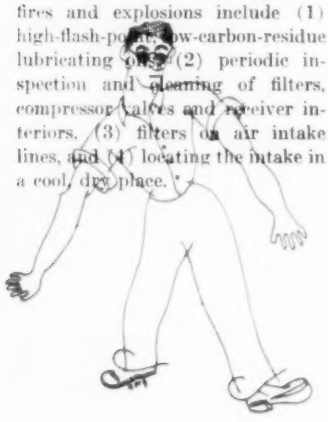
# LEARNING THE

## AIR COMPRESSOR FIRE

COMPRESSED air users will be interested in a fire *inside* one of four huge air receivers at a large shipyard. The first evidence was from oil deposits on the outside of the receiver starting to smoke. With commendable promptness, the operating engineer shut down all air compressors, closed connecting valves to prevent spread of fire to other receivers, and bled the system of air. He next removed the manhole cover but by then the fire had practically burned itself out.

There were no filters on the air intakes for the compressors which supplied the receivers. Leakage past the valve would produce friction and heat, and it is likely that a piece of red-hot dirt or carbon carried over into the receiver, igniting carbonized oil deposits. The receiver tank was distorted badly enough to require replacement. Valves and piping were also damaged. Total property damage was about $1700.

Safeguards against compressor fires and explosions include (1) high-flash-point, low-carbon-residue lubricating oils; (2) periodic inspection and cleaning of filters, compressor valves and receiver interiors. (3) filters on air intake lines, and (4) locating the intake in a cool, dry place.



## WRONG LINE

A WELDER and his helper were repairing a petroleum tank. For the purpose of circulating air in the tank, the welder inadvertently connected an air hose to a gas line. An explosion occurred when gas instead of air filled the tank. Many accidents have occurred recently because somebody mistook gas for air.

## THE PLACE NOBODY GOES

A CLAY mixer at a pottery had most of its dangerous parts completely enclosed but at one point an opening had been left for the escape of dust. This opening was against the wall, in a place to which nobody needed to go.

One day a boy who worked at another part of the machine left his normal place and, for some unstated reason, walked over the boxed and fenced gears until he was near the unfenced portion. He slipped, his foot went through the opening, and he lost his leg.

This seems to be another example of the accident that occurs in the place that nobody goes.

## UNAUTHORIZED CUTTING

WHILE a 750 hp. compressor motor was being repaired at a large automobile plant, employees were cleaning it with mineral spirits under air pressure. Meanwhile, another employee began using a cutting torch at near-by machinery without having secured permission. Sparks spread into the pit under the large motor, igniting the oil and mineral spirits. Employees quickly extinguished it with a 40-gallon foam engine. One field coil was damaged and varnish on windings was scorched.

Stricter control of cutting and welding can eliminate these fires and operations should be carefully supervised.

# HARD WAY

## MOVING MACHINERY

HAVING just removed the steel guard over motor gear drive in order to burn a hole in it for oiling purposes, the foreman looked into the unprotected machinery. Noticing that the gears were not meshing properly, he tried to adjust the motor base while the equipment was still running. His wrench slipped, resulting in amputation of three fingers and part of his palm.

## "FIREWATER" BY MISTAKE MISTAKE—

A FIELD engineer mistook a jug of carbon tetrachloride for a water jug and drank from it. The jug had been used by a member of the safety committee to fill fire extinguishers and had been left on the shelf where the water jug was usually placed. The jug had no marks to indicate the nature of its contents.

This accident, which caused six weeks disability, can be attributed to pure carelessness and by a member of a safety committee, at that.

## CARELESS TOOL HANDLING

TWO carpenters were engaged in a remodeling job in the basement of the plant. As one of the men reached over the other who was in a stooped position, the stooping man stood upright. A chisel, which he was carrying in his pocket caught the other man's wrist cutting a deep gash. The injured man lost two weeks time. The practice of carrying sharp tools in the pockets often results in severe injury.

## RUNNING ENGINE CAUSES INJURY

THAT no work should be performed on any engine while it is still running cannot be too strongly emphasized, for it is one of the oftenest ignored safety rules. Having raised the hood of an engine, but not removed it, which made for a limited working space, the employee began to tighten cylinder head bolts on a welding machine. His hand slipped and struck the fan which was in full motion. Both index finger and thumb were broken, necessitating his being away from work for several days.

## TRIPPING HAZARD

A LAMP cord, lying across the floor of a service station, tripped the attendant who was carrying a battery which he had just recharged. In falling the man's thumb was caught under the battery and fractured. This is one of the housekeeping rules that has to be stressed over and over.

## FATAL BURNS

A WORKMAN was carrying an open pail containing two or three gallons of gasoline, which he was about to empty into a tank. He rested the pail on some batteries, shorting the terminals and causing a spark which ignited the gasoline. He was burned to death. The danger of handling explosive or flammable liquids in such a way is obvious but the actual way in which it was ignited is unusual.

A cigarette or match or a spark from an engine might have produced the same result.

## CLERK BREAKS A LEG

A SUPPLY clerk who definitely wasn't up on his safety code tried to measure a length of pipe while standing on an unblocked pile of pipe.

The inevitable happened of course. The pile shifted, and a piece of pipe struck his leg, breaking the tibia and causing contusions to the lower leg.

# Lights To Aid Berlin Airlift

A LEADING electrical equipment manufacturer is rushing construction of 42 of the world's brightest lights for installation by the U. S. Air Force at German airports to help pilots flying the Berlin airlift in landing during bad weather when visibility is low. A six-light system will be installed at each of the seven different airports, including Berlin's Tempelhof Airdrome, to reduce the hazard of fog, snow, and rain and assist pilots in locating the field visually despite winter-time bad weather.

The six lights in each system will flash, one after another, in the wink of an eye and appear as a streak of lightning to the pilot. The line of six lights will flash about 40 times a minute. Each of the new lights, containing the rare gas, krypton, has a brilliance of more than 3,000,000 beam candlepower. Tests have indicated that this flash will cut through at least 1,000 feet of fog.

The first commercial installation of the new approach lights already has been made at New York's new International Airport on Long Island where a row of 70 lights extends out into Jamaica Bay on a special pier. In addition, a test installation of six lights—three krypton and three neon—has been operating at the Cleveland Municipal Airport for more than a year and a half and has already been credited with saving lives. The six-light systems for the Airlift are intended as identification and lead-in lights for the standard approach systems. They will be installed in a row 1,000 feet long at 200-foot intervals out beyond the end of the instrument runways.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## We're Still Burned Up

FIRE losses in the United States began their annual winter climb during November, totaling $52,949,000, an increase of 2 per cent over losses of $51,845,000 recorded in October, according to estimates announced here by W. E. Mallalieu, general manager of the National Board of Fire Underwriters.

November's losses brought the total fire destruction for the year to date to $641,717,000, an increase of 2.7 per cent over losses of $624,274,000 for the first 11 months of last year.

On the basis of these figures, destruction by fire throughout the United States may break all records during 1948. Losses so far this year are just $50,918,000 less than the record breaking $692,635,000 loss reported for the United States during 1947.

The losses during November were 3 per cent higher than losses of $51,346,000 recorded during the same month in 1947.

Destruction by fire during the past 12-month period ending November 30 is estimated at $710,078,000, which approaches the all-time high of $711,576,000 reported for the 12-month period ending September 30 this year. This estimate of $710,078,000 is 4 per cent greater than losses of $682,368,000 reported for the 12-month period ending November 30, 1947.

These reported losses under fire insurance policies include an allowance for uninsured and unreported losses.

## Employee Recognition in Award Ceremony

PIPE fabricating welders in the St. Louis plant of Midwest Piping & Supply Co., Inc., whose department completed 278,978 manhours without a lost-time accident, received recognition for their outstanding safety record recently with the presentation of a certificate from their insurance carrier. The 97-man department has an unmarred accident record for the past 20 months.

Alert to the incentive for safety that stems from the home and to the meaning of job safety to a man's family, Midwest's management invited all employees' families to the ceremony honoring the welders. Wives and children were given a share of the commendation for the safety record, and were encouraged to keep up a lively interest in the safety program at home, for their own sake as well as that of the breadwinner.

Twelve hundred persons, including the employees and their families, were welcomed by A. G. Stoughton, Midwest's president, at the company-sponsored program of entertainment which accompanied the safety ceremony. Erwin H. Telthorst, plant safety committee chairman for 11 years, spoke on the relationship of safety in the plant and safety in the home. His talk was climaxed with a safety film.

Plant officers and office workers donned aprons to prepare and serve 200 sandwiches and other refreshments to all attending the meeting at Moolah Temple. S. G. Ruez, a foreman of the pipe fabricating welders, accepted the certificate award from H. B. Stringer, safety engineer for the insurance company's St. Louis office.

# industrial Hygiene

ASSOCIATE EDITOR
JACOB A. GOLDBERG, A.M., Ph.D.

# A CHECK LIST FOR THE OCCASIONAL SOLVENT USER

ACCIDENT records suggest that trouble with solvents arises more frequently where these chemicals are used only occasionally or in comparatively small quantities than where large quantities of solvent are regularly employed. The reason seems to be unfamiliarity on the part of the small user with the need for precautions or with the measures which should be taken, warns the Safety Research Institute.

Because even a single instance of careless or improper handling of a solvent during operations such as cleaning, degreasing or thinning may under certain circumstances result in a fire or sickness, or both, depending upon the solvent used, the following points should be checked:

1. What does the label say?

Many solvent containers are labeled with recommendations for safe use. If the label has no such information, the manufacturer or packager may be of assistance in providing safe handling data. When smaller cans or bottles are filled in the shop from larger containers, the smaller containers should also be clearly labeled.

2. Are solvent containers always kept closed?

Self-closing safety cans are useful when containers must be opened frequently. Open pails are unsafe for storing or carrying solvents.

3. Is there plenty of ventilation?

Any solvent operation, unless it is carried out in entirely enclosed equipment, may give off dangerous quantities of vapor. Depending upon the operation, open windows, mechanical ventilation or gas masks may be the best way to protect workers from inhaling the vapor. Where a solvent is used frequently, even in small quantities, mechanical ventilation is probably essential. Industrial hygiene services of local and state health or labor departments are glad to advise on ventilation.

4. Is there a noticeable odor of solvent in the workroom?

The absence of solvent odor does not always indicate that the air is safe. However, a noticeable odor generally means that there is too much vapor in the air, even for fairly short operations.

5. Are workers' hands being soaked in solvent?

Whenever solvent may wet the skin frequently or for considerable periods of time, protective gloves of a solvent-resistant material should be worn to prevent dermatitis.

6. Are workers trained to be good "housekeepers"?

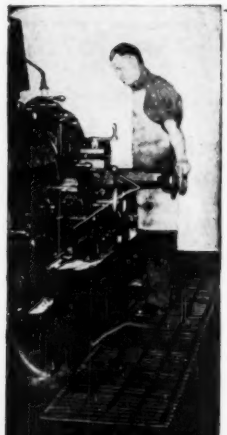
Solvents should be handled to avoid spilling, and solvent-soaked waste and rags should be disposed of in airtight containers.

7. Are solvent operations well supervised?

The plant manager or owner must often be his own safety director, to make certain that workers handle the solvent according to instructions and use gloves, gas masks or other safety equipment provided.

8. Are the men who work with solvents in good health?

Those who work with solvents should report stomach upset, dizziness or other illness to a physician, since these may be symptoms of exposure to solvent vapors. Alcoholics and those suffering from certain organic illnesses should not work with solvents. In many companies, preplacement examinations are given to employees before they are assigned to solvent operations.



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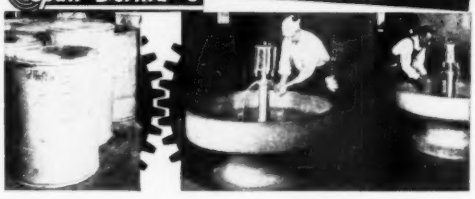

another cog in better employer-employee relations

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# API Toxicological Reviews

THE evolution of petroleum refining, from a relatively simple process of thermal distillation and acid treatment of products to a variety of complex catalytic cracking and numerous other involved processes and treatments, has been accompanied by an ever-increasing need for accurate and concise information on the toxic properties of substances handled and used in the modern refinery. To be of greatest value such information must be compiled by trained and experienced personnel under the direction of recognized medical authorities. It should be made available by publication in convenient form for daily use as well as reference purposes; therefore, it should include a comprehensive summary of best available facts, tentative recommendations pertaining to the application of the data, and a complete bibliography of the source material. The data should be published in a form which will facilitate re-issuance promptly upon the availability of new and additional information.

These are the objectives which have been sought by the series of monographs entitled *API Toxicological Reviews* which are being published in form for collection in standard ring binders to facilitate usage by petroleum refiners.

Some of the reviews are incomplete. This is inevitable because they represent a compilation of available information, and the present state of knowledge with respect to some of the substances considered is incomplete. It is hoped that this fact will serve to stimulate the quest for further knowledge. These reviews should be considered a beginning, not an end.

Each review is organized along fairly definite lines for the sake of clarity and utility. Sect. I presents the information necessary to identify definitely the substance, whereas Sect. II presents the general physical and chemical properties of the substance. Particular emphasis is given those characteristics influencing volatility, as these have a marked influence on the degree of atmospheric exposure which is likely. Sect. III considers the probable conditions and sources of exposure to the substance, and the considerations presented in subsequent sections assume the type of exposures cited unless otherwise specified. Sect. IV considers the toxicology of the substance. Where sufficient information is available, this section is divided into general considerations, including information on metabolism and excretion; acute effects, chronic effects and, finally, safe limits of exposure for an 8-hour period 5 days a week. Sect. V presents any available information on the treatment of poisoning by the substance under consideration, with particular emphasis on specific therapeutic measures. Sect. VI discusses suggested preplacement or periodic examinations as tentative recommendations for workers likely to be required to undergo significant exposures to a toxic substance. It is assumed that all workers will

undergo a careful and complete preplacement examination, including a chest X-ray, so that emphasis is placed on special tests or examinations pertaining to the substances under consideration. Sect. VII discusses precautionary measures, both mechanical and personal, which are suggested for use in handling the substance under consideration. The final section, Sect. VIII, presents a selected bibliography documenting the information given in previous sections.

The series of toxicological reviews has been planned by the Institute's Medical Advisory Committee, and prepared for its Subcommittee on Permissible Concentrations, at the Harvard School of Public Health, Boston, Mass., under the direction of Professor Philip Drinker. The publication of the series of reviews has been approved by the Safety Committee of the Board of Directors of the American Petroleum Institute.

Anyone desiring to submit additional information or proposed changes for consideration prior to re-issuance of this review is requested to send them to the American Petroleum Institute, 50 West 50th Street, New York 20, N. Y.

## The Physically Impaired Worker

THIS report compares the work performance of physically impaired persons and unimpaired workers on the same jobs in respect to absenteeism, work injuries, output, and stability on the job. Consideration is also given to placement practices and the jobs at which the impaired persons were employed. Separate chapters are devoted to the work performance records of persons having each of the ten specific impairments included in the study.

Copies of this report may be obtained from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C., at 55 cents a copy. Remittance should be in check or money order.

## Oil Chemists Meet

THE nutritional aspects of glyceridic and edible oils, and the large part they are playing in the national economy, were thoroughly examined by the nation's leading oil chemists at the fall convention of the American Oil Chemists' Society at Hotel Pennsylvania in New York, Nov. 15–18.

In addition to emphasis on the glyceridic oil field, 54 other technical papers by expert chemists were presented during the four-day session covering soap and detergents, the analytical side of oil chemistry, drying oils, industrial uses of fatty oils and acids, research, nutrition, and antioxidants. Dr. Foster D. Snell was general chairman of the meeting.

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# THE INDUSTRIAL *Nurse*

EDITOR
ROSAMOND J. WEBSTER, R.N., A.M., Ph.D.

## From "Industrial" Relations to "Medical"

AN ANNOUNCEMENT of particular interest to medical department personnel was made public in the latter part of November. This relates to the transfer of the administration of human relations activities from the industrial relations department of a large oil company to its medical department. The move was made because the officials of the company have come to feel that the traditionally confidential doctor-patient relationship will prove more effective in solving intimate personal employee problems not connected with jobs. The medical director of this company commented that employee productivity is curtailed considerably by problems encountered outside the work environment, and added that management is anxious to aid in their solution. Many employees, it was found, will not reveal to industrial relations executives the nature of a number of problems adversely affecting their work because they fear they will become public property, that is, that other employees will learn of their problems. On the other hand, workers have been found to be willing and anxious to come to the medical department because they are confident that all information provided by them will be kept in strict confidence. It is evident that only large establishments can maintain industrial relations departments. Many more find it possible and economical to provide medical and nursing facilities. This reported move is further evidence of the latent opportunities available to industrial nurses to serve workers in many ways. First aid is only one segment.

## Nursing for the Future

ALL industrial nurses must by this time have had their attention drawn to the important study of the nursing profession by Dr. Esther Lucile Brown. This study was undertaken for the National Nursing Council and covers the extension of health services, future demand for nursing care, differentiation of nursing service according to function, the future role of the professional nurse, education for practical and graduate bedside nurses, and education for the professional nurse. Most likely, this report will have an important effect on the future of the nursing profession for many years to come. It is strongly recommended that the volume be read and studied and if possible, discussed by groups of industrial and other nurses. Its full implications can but be hinted at. In raising the question as to the implications of nursing in the future, Dr. Brown points out that an enormous supply of nursing care will be needed in the years immediately ahead if, as seems most likely, hospitals and public health agencies will increase in number and size; if specialized hospitals for tuberculosis and for mental and chronic diseases are to provide more active treatment, and if industry, municipalities and other corporate bodies decide to broaden the scope of their health services. To meet these new challenges, it will be necessary to provide different categories of nurses, with different educational backgrounds and standards of training.

## Health at Work

THIS is the title of a series of interesting four-page publications intended for industrial nurses and issued by one of the large mutual insurance departments. Those currently available are sub-titled "Industrial Health Education," "The Preplacement Physical Examination Program," "Periodic Examinations in Industry," and "Vacations Ahead." These pamphlets are concise, well written and of practical interest. For instance, the one entitled "Periodic Examinations in Industry" explains the purpose of in-plant medical service. To quote some of the opening statements: "A well rounded medical program" must include recognition of and a continuing attack upon illness, aging defects, improper placement, occupational diseases and any other medical conditions that may prevent optimum health in the worker. A medical program that limits itself to pre-employment examinations and treatment of plant injuries is not offering to industry the full benefits that are to be derived from an industrial health program that

includes the gamut of the preventive phases of industrial medicine."

It is indeed interesting and a sign of real progress that an important insurance company will issue these welcome publications written especially for industrial nurses. Others in industry can profit from a reading of them as well. The editor will be pleased to forward requests for these publications to the proper source.

## The Irritable Heart

MUCH is heard of the so-called irritable heart during war years. Other names have been applied to this recognized form of neurosis, including effect syndrome and neurocirculatory asthenia. While it has been met with chiefly among soldiers under the stress of war, it also is observed in young people of both sexes in time of peace, although only rarely in the extreme forms seen in those in active military service. A majority of the patients show signs of constitutional inferiority, either nervous or physical. Among the exciting causes the most important seems to be severe and prolonged nervous strain, together with fatigue and physical exhaustion. Rapid heart, palpitation, throbbing arteries, cardiac distress, fatigue, tremor, sweating are among the symptoms. Occasionally some young people are found in industrial and commercial establishments who present several of these symptoms perhaps upon even slight or moderate exertion after a long and active week-end or holiday or because of some emotional experience within or outside of the working premises. They are apt to complain about the amount of work assigned, that the speed required of them is too great, that other normal demands are excessive. They may often be well educated and of superior intelligence. That they present a problem of adjustment and proper placement is evident to all who have had experience with them. Pre-employment examination, history of previous work experience, references from former employees, work record during first few days and weeks of employment should throw light upon their suitability for specific jobs.

## Differences

AN INVESTIGATOR tried an experiment on 6,377 people with a chemical to determine their ability to judge it by the sense of taste. Of those so tested, 21.3 per cent found it tasteless; 64.3 per cent found it to be bitter, many extremely so; 5.4 per cent found it sour; 2.1 per cent found it sweet; 4.8 per cent found it salty, and the remaining 1.9 per cent ascribed to it miscellaneous tastes. As might be expected, the investigator had prior knowledge of similar differences among individuals in many other respects. Differences between people arise on an inherited basis. Inherent individuality is highly developed in man. Superimposed on these variations are differences induced by environmental and cultural factors. It is important for those in positions of supervision and responsibility to recognize that fundamental differences exist between individuals, as in the case of color blindness, nervous reactions, taste, and in many other ways. Without the knowledge that comes from such recognition, it becomes rather difficult for supervisors to fulfill their own responsibilities. Men show so many variations under the same circumstances in the same place and at the same time, that no rule, except that of difference, can be recognized. When this is done intelligently and with recognition of the upper and lower limits of permissible and acceptable variations under normal working conditions, much difficulty can be avoided.


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## The Nation's Health

UNDOUBTEDLY all those engaged in health maintenance of industrial workers are aware of the long term effort to introduce some form of governmental health insurance in this country. The studies and reports of the Committee on the Costs of Medical Care helped to present the background through efforts to enact federal and state legislation go back some years prior to the work of this Committee, completed about a decade ago. Since then, others in the federal service have been at work. Legislation has been introduced in congress and has aroused considerable and nationwide discussion. As of September 1948 the Federal Security Administrator, Mr. Oscar R. Ewing,

submitted a 186-page report to President Truman entitled "The Nation's Health." The report analyzes the health needs of the country, the question of financing the health program, the need for more hospitals, health insurance, mental health, chronic diseases, rehabilitation of the handicapped, recommended community action, with many charts and tables to illustrate and emphasize the subjects covered. A short time after election day, President Truman issued a statement to the effect that he planned to recommend the adoption of some such plan as proposed by Mr. Ewing. On the other side, the American Medical Association has announced the plan to raise over $3,000,000 to fight the adoption of a health insurance scheme by the federal government. This is an extremely important issue which has many implications for those engaged in health maintenance in industry. The Ewing report warrants study irrespective of one's attitude for or against the proposed plan. Try to get a copy from your local library, or from the Government Printing Office, Washington, D. C. (Price $1.00.)

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# The Mechanical Properties of Bones

RESEARCH with human bones by Frank C. Smith of the National Bureau of Standards has indicated that ordinary laboratory techniques and instruments may be applied to obtain the much needed data on the mechanical properties of bone—knowledge necessary in predicting body behavior under impact loads as encountered in aircraft crashes, seat-ejection from aircraft, parachute opening, and exposure to blast. Dr. Paul Calabrisi of the George Washington Medical School and the Naval Medical Research Institute is collaborating in the study particularly in connection with the anatomical problems encountered. Preliminary but significant results have been obtained in these investigations.

Many instances are known of aircraft and other vehicles crashing to complete destruction where occupants emerge from the wreckage miraculously unhurt. Conversely, a relatively slight blow to certain sensitive portions of the body may have serious and even fatal consequences. It has also been found that naval personnel have been seriously injured from exposure to blast or sudden displacements of ship's structure following the explosion of torpedoes, mines, or the firing of guns.

Since the human skeleton provides support for the body and protection for vital organs, it was decided to begin the study with an investigation of the mechanical properties of human bones and joints. Results are to be used in the design of simplified mechanical models of the human frame which will make possible an estimate of the forces set up in the body during impacts of various types.

The study was initiated with measurements of the mechanical properties of the structural members of the skeleton, beginning with long bones, and was designed to establish average values on a statistical basis. The initial work involved seventeen tests on specimens made from bone of the compact type removed from near the middle of the bones of the extremities of humans and monkeys. Fourteen of these tests were made in compression with the direction of the load parallel to the fibers of the bone. One was made in compression with the direction of the load perpendicular to the bone fibers, one in bending, and another under torsion load. Test specimens consisted of sections removed from the bones, and of portions machined into plates and hollow cylinders.

Stress-strain, flexure, and torsion curves plotted from the test data reveal an interesting and significant factor regarding such properties of human bones. The curves are found to lie in approximately straight lines up to failure, thereby simplifying the analysis of the mechanical behavior of the body structure. This means that the load-displacement relations for long bones may be approximated by simple linear equations.

The results of the tests showed the average ultimate strength of the fourteen compression specimens to be about 23,000 lb/per sq in. The fifteenth specimen, in which the load was applied at right angles to the bone fibers, had about the same ultimate strength, indicating that the effect of the direction of loading on the bone is small. These strength values are in good agreement with those reported by the early German investigators. The strength of the bone in bending, i.e., extreme fiber stress at failure, was slightly lower than the strength in compression. The computed ultimate shear stress for the torsion to failure was about 15 percent of the compressive strength.

These preliminary data indicate that bone may be considered an elastic, brittle material, having about one-fourth the compressive strength of cast iron and more than twice that of hickory wood. The average Young's modulus of elasticity of the bone, about 2.8 x 106 lb/per sq in., is approximately one-tenth that of steel, or about equal to that of wood. A simple relation was found between the Young's modulus and the specific gravity of the bones tested.

Plans for the next phase of the Bureau's program include compression tests of an entire human knee-joint in the "standing" position. Loads will be applied to the joint in a manner similar to that in which an actual joint is loaded while a person is standing and measurements made of the consequent deformation of the joint. This test should provide some data on the "spring constant" of the joint, from which a mechanical analogue may be constructed out of springs or rubber. Also under way is a study of the possible correlation between the X-ray absorption properties of bone and its strength and/or stiffness. Such a relationship would be useful in estimating the strength of living bone from X-ray data.

# NEW PRODUCTS

For illustrated descriptive literature of products listed in this section readers may apply

TO SERVICE DEPT., SAFETY ENGINEERING MAGAZINE

## FIRE EXTINGUISHER INVENTION

MADE according to specifications of outstanding fire protection experts, Bostwick Laboratories of Connecticut, announce a new 16 oz., portable, pressurized, low cost fire extinguisher, called HERO. Because it is hermetically sealed, cannot leak and needs no refilling or inspections it is ever-ready to fight all types of fires for years, on jobs, homes, cars, boats and all fire danger points, according to the Bostwick Laboratories. Simply operated, pull trigger and aim 18 ft. pressurized stream at fire. Comes with free wall bracket or can be carried in tool, car or home kits or drawers.

U. S. Testing Company's report #98403 shows that Hero puts out gasoline, fuel oil, grease, paper, electrical and all types of fires in three to ten seconds.

Fluid meets Underwriter Laboratories and U. S. Gov't Of-380 specifications, the makers state. It contains 90% carbon tetrachloride, 10% other chemicals, with carbon dioxide as propellant, and is not injurious to persons, animals or materials contacted. Please use convenient coupon.

## INDUSTRIAL RECORDS

THE R. K. B. Associates of Chicago announce the development of a new type series of work and background music transcriptions. Created specifically for industry and commerce, the records are being marketed under the "Chrome Seal Transcriptions Background Music" label.

Recorded on regular twelve-inch vinylite records, the transcriptions are instrumental only, and recorded on an even level so that the music will not be disturbing for the most exacting type of work. The transcriptions are available in both regular 78 r.p.m. and 33⅓ r.p.m. long-playing discs.

The two sizes offered are meeting with the approval of the many factories, stores, offices, institutions, restaurants and other public and private establishments which already have installed amplification systems. With the recent introduction of new type record changers, it is possible to use either size transcription.

Each Chrome Seal Transcription bears the names of the selections, indicates whether they are in slow or fast tempo and shows the recommended time of day for playing. Music for recreational listening is so marked in order to simplify programming. With Chrome Seal Transcriptions, music may be planned easily for the entire day.

## NEOPRENE MAT

NOW being offered by the American Floor Products Company, is the Neo-Sponge Comfort Mat, described by American's President Everett C. Bentley as the "best all-around sponge-rubber-like industrial standing mat ever developed."

DuPont Neoprene, blown into millions of tiny sealed in nitrogen balloons, gives Neo-Sponge Comfort Matting an entirely new, different, and more restful cushioning effect. Triangular raised "feet" on both sides of mat provide non-slip foot traction, and make the mat reversible.

In addition, Neo-Sponge Comfort Matting is non-absorbent. It is an excellent insulator, both thermally and electrically; and unlike rubber, it is resistant to deterioration by greases, fats, oils, heat or acids. Please send in the coupon.

## DISPENSER FOR COMBINATION SKIN PROTECTOR AND CLEANER

CONSIDERABLE savings under liquid or scrubber soap costs are claimed for the Practi-Kreme Dispenser system by Chemical Specialties, Inc., of Massachusetts. An extra feature is the added protection against dermatitis claimed by the makers of Practi-Kreme which is said to combine in a single product features of both a skin protective cream and cleaner.

The attractive, rugged, new, cast-aluminum dispensers, loaned free to Practi-Kreme users, are installed in the plants near the machines to dispense the cream before work as a protector and afterward as a deep-penetrating, highly efficient skin cleanser. Literature is available. Please use convenient coupon.

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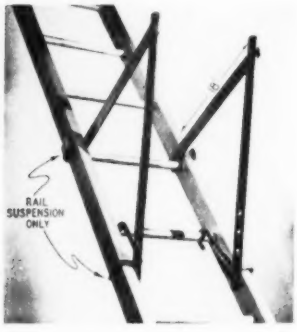


January, 1949

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- ☐ Neoprene Mat
- ☐ Soap Dispenser
- ☐ Silicated Paint
- ☐ Ladder Jacks
- ☐ Non-Slip Paint
- ☐ Heavy Duty Glove
- ☐ Adjustable Climber
- ☐ Gas Flow Meter Unit

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## NON-SLIP PAINT CUTS DOWN ACCIDENTS

SURE-FOOT is a new type of non-slip abrasive paint, scientifically formulated by the Frost Paint and Oil Corporation of Minnesota, for application to industrial or public floors and surfaces where slippery conditions prevail. It is economical, efficient, and comes in easy-to-apply paint form.

The abrasive properties in Sure-Foot are provided by carbide crystals to assure long rugged service and a non-slip surface under all working conditions.

Low in initial cost, Sure-Foot is easily applied by brush or trowel and dries overnight to a tough traffic resistant covering which remains non-slip, whether wet or dry.

Frost's Sure-Foot is recommended for areas around machines where oil, grease, cutting compounds, or water solutions are present. Ideal, too, for loading ramps, platforms, cat walks, docks, aisles, truck beds, stair treads, traffic ways. It adheres tenaciously to wood, concrete, steel, aluminum, solid or perforated areas and is fire retardant. Available in colors gray, red, black, green and blue.

## HEAVY DUTY GLOVE

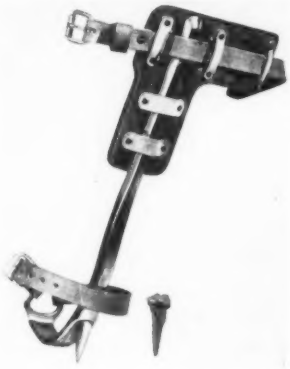
A NEW heavy duty glove, ideal for handling small castings, rough stock, grinding and similar work has been added to its safety clothing line, American Optical Company announces.

Made of specially treated chrome tanned cowhide for long wear, the glove features a canvas back with elastic strap to overcome hand fatigue while providing a cooler feeling and snug fit.

All necessary seams are steel sewed and the seam along the forefinger has been eliminated for longer glove life and added comfort at this vulnerable point.

Wearing surface of the palm has been increased by extending the palm, and there is no bib patch—another comfort feature. In addition, the steel stapled strap at the thumb crotch fortifies this part of the glove. A steel stapled patch is on the face of the thumb. Please send in the coupon.

## MILLER ADJUSTABLE CLIMBER



AFTER two years of research and development, Miller Equipment Company, Inc., of Pennsylvania, introduces a new, modern adjustable climber. Scientifically designed, the Miller Adjustable Climber offers the following exclusive features:

U-Channel Shank design providing greater strength with less weight. A Removable Gaff of improved design making it almost impossible to cut out on a pole. Gaff can be replaced on the job by simple operation of special locking key. Greater foot surface for wide shoes and winter rubbers, and better arch support.

Improved eye for attaching climber straps offers more comfort to the wearer and maximum strap wear. A new, practical screw-fastened adjustable shank allowing size ranges from $14\frac{1}{2}$ to $17\frac{1}{2}$ inches. The Miller Adjustable Climber was designed by one of America's leading design engineers, and every exclusive feature has been field tested. It is now available for prompt shipment. Literature and prices may be had by sending in the coupon.

## GAS FLOW METER UNIT

TO ASSURE maximum efficiency with proper flame balance, higher spraying speeds and gas savings in the operation of metallizing guns, the Metallizing Engineering Co., Inc., New York, introduces the new METCO Type GF Gas Flow Meter Unit.

The METCO Type GF—Removes the "human element" from flame balancing by enabling the operator to adjust the gas balance so that it is exactly right for each particular metal. Any restriction in flow or change in pressure is shown immediately. They reduce the cost per pound of metal sprayed by providing a positive adjustment to the most efficient flame and allow the characteristics of the coating to be controlled closely. They have been designed to give accurate laboratory or research metallizing. Please use the coupon.

SAFETY ENGINEERING
75 FULTON ST.

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## PLANT MAINTENANCE & SANITATION

**Vacuum Cleaning Equipment** 1

U. S. Hoffman Machinery Corp.—2 new booklets describe HOFFMAN Heavy Duty Vacuum Cleaning Equipment. The first, a 16-page booklet, gives complete information and many illustrations on HOFFMAN Stationary Type Vacuum Cleaning Systems with fixed piping. Construction details, nozzle attachment descriptions, piping layout, and methods of connecting piping are given. The second, an 8-page booklet, describes HOFFMAN Heavy-Duty Portable Vacuum Cleaners designed and built for industrial use. Detailed information shows how 4 sizes of HOFFMAN Portable Equipment makes industrial cleaning practical and economical for all plants.

## DUST & FUME CONTROL

**Blast Cleaning & Dust Control Equipment** 2

Pangborn Corp.—New, 24-page booklet shows equipment for every blast cleaning need—from cabinets, tables, barrels and rooms designed for general job foundries, to the largest continuous production ROTO BLAST machines. Also described are PANGBORN Dust Collectors, fans, dust wetters, etc. Details of size and price on all items in the PANGBORN line are given.

## PAINTING FOR SAFETY & HEALTH

**Industrial Maintenance Laboratory** 3

American Marietta Co.—New, series of ten booklets answer painting questions in each off ten industries. These are: baking, brewing, bottling, canning, dairy and creamery, institutions (schools, churches, hotels, office buildings and colleges), laundries, paper, power and sewage disposal. Included are chart arrangements showing—for each industry—a listing of correct primers and finish coats for every need from boiler breeching to zone or traffic markings; particular characteristics of resistance to moisture, abrasion, washing solutions, acids, alkalies, fumes, heat, oil and grease, colors; coverage; drying time; thinning from spray painting, etc.

## FLOORING & FLOOR COVERING MATERIALS

**Non Slip, Non Static Floor Matting** 4

Buckner Process Co.—New, six-page booklet describes and illustrates LION PAW Safety Matting and Stair Treads. Booklet points out that product has been tested and approved by Worcester Polytechnic Institute for use in front of electrical switchboards. While the manufacturing process is kept a secret, booklet shows that the finished product contains no rubber, cannot dry out or deteriorate with age, and it is both oil and water resistant.

## EDUCATIONAL AIDS

**Safety Award Programs** 5

Gordon B. Miller & Co.—New, 8-page booklet describes the basic factors essential to planning and maintaining a successful accident prevention program. This company, creator and producer of individualized emblems and awards, maintains a safety engineering staff to assist you in planning a practical safety award program designed to reduce injuries for your organization.

## HOW TO PROVIDE LOW COST ROCK SALT STORAGE

TODAY many hundreds of towns, cities, counties, states, bus companies, traction companies and other firms rely upon Sterling Rock Salt to provide safe highways, streets and sidewalks.

Rock Salt at the mines, no matter how much is available, does not help you one when winter storms hit. It is only of use when it is on the spot, ready for immediate application to provide safe highways for transportation and to save life, limb and property.

When heavy storms hit, rail trans portation is slowed up, delivering deliveries and when these storms are over wide areas, there is a great demand for salt to be shipped all at one time. Due to washing out supplies, delays are sometimes encountered and the only way that proper highway maintenance can be assured is to have adequate stocks on hand at all times at convenient locations for quick loading to facilitate immediate application.

This problem has been solved for many street and highway commissions by taking early delivery of Rock Salt in July, August and September, storing it for winter use and maintaining those storage piles to capacity.

A study of existing storage facilities plus research and proper storage of Rock Salt made by the engineering staff of International Salt Company, Inc. indicates that it is a simple matter to set up adequate storage space at low cost. Unused buildings, garages, covered sheds and loading platforms make satisfactory storage sheds and if these cannot be provided, salt can be piled on the ground in the open and covered with tarpaulins.

In developing storage facilities there are a few factors which can be considered for best results. This booklet describes and presents drawings of various types of economical storage facilities.

If additional information is desired, write to the International Salt Company, Inc. Scranton, Pa. or get in touch with the Company's representative in your district. Further information and advice will be gladly given.

**ENGINEERING DATA**

| Weight and Volume of Bulk Sterling Rock Salt | Weight and Volume of 100 Lb. Paper Bags of Sterling Rock Salt |
|---|---|
| 1 cubic ft. salt = 72 lbs. | 1 100 lb. paper bag, approx. 1' x 17' x 30" |
| 1.39 salt = 100 lbs. or 1 cubic ft. | 1 100 lb. bag = 1 cubic ft. |
| 1 ton salt = 27.8 cubic ft. | 1 cubic ft. bags = 80 cubic ft. |
| | 1 cubic ft. bags = 50 lb. (1 cubic ft.) bag. |

These are safe figures for Loose Rock Salt. A compression due to long storage or piling will slightly reduce the volume per unit weight.

Tight piling and compression will slightly reduce the volume per unit weight.

## SNOW & ICE REMOVAL

**Rock Salt Storage Methods** 6

International Salt Co., Inc.—New, 4-page pamphlet suggests methods of storing rock salt simply and economically during the late summer and fall months. Engineering data and sketches, indicating both indoor and outdoor storage, are given. Also covered are such factors as the amount of space required for storing various tonnages of either bulk or bag rock salt, piling arrangements, weight and volume of bulk rock salt, and rock salt in 100 lb. paper bags, and the slope required on chutes for loading and unloading rock salt.

**Recommended Practice for Snow & Ice Removal** 7

Highway Research Board—Second revision of Bulletin 9-2R, presents interesting and helpful information on recommended practices for snow removal and treatment of icy pavements. While pamphlet is primarily designed for highway engineers, much of the information can be applied to solving ice and snow removal problems of industrial plants and properties. Presented are recommendations for training programs, drift control, markers for drainage and structures, types of equipment, lighting and color scheme of equipment, plowing, and ice removal methods.

## FOOT PROTECTION

**Safety Toe Shoes** 8

Titan Safety Shoe Co.—New, 16-page booklet describes and illustrates ALIV Safety Shoes. Shoe styles described include: High Top and Oxford Safety Shoes, dress oxford shoes with safety toes, high top rubber shoes with safety toe, and 10 and 15 inch rubber boots with safety toes. Sizes and widths, sole compositions, and color of each shoe style are given. Booklet points out that all ALIV Safety Shoes conform to American Standards Association specifications.

## ARM & HAND PROTECTION

**Gloves, Mittens & Hand Pads** 9

American Optical Co.—Well illustrated, 4-page folder presents AO steel reenforced gloves, mittens and hand pads which offer maximum protection to materials handling workers. Booklet points out that while glove parts subject to greater wear are reenforced by steel staples, carefully designed glove provides adequate hand flexibility. 13 styles of gloves, mittens and hand pads, made from chrome-tanned side-split cowhide, are described in detail.

## LADDERS & SCAFFOLDING

**Ladder Shoes and Pole Grips** 10

Rose Manufacturing Co.—New, 12-page bulletin describes SAFE-HI ladder shoes which prevent ladders from slipping on smooth, dry surfaces; wet, slippery surfaces; greasy and soapy surfaces; and snowy, icy surfaces. Construction details of regular and non-sparking ladder shoes are described thoroughly. Illustrations and descriptions of pole and wall grips for ladders are given.

## FIRE FIGHTING & RESCUE

**Aluminum Fire Ladders** 11

Aluminum Ladder Co.—New, 3-fold catalog presents complete line of aluminum fire ladders. Catalog gives both specifications and prices of 62 pieces of equipment, falling into 8 general categories. Ranging from simple wall ladders to heavy-duty extension ladders, this equipment fills the needs of large metropolitan fire departments and small plant fire brigades, alike.

## GUARDS & ACCESSORIES

**Photo Electric Power Press Guard** 12

Hoffman Engineering Corp.—New, 9-page booklet describes the HOFFMAN Electronic Controlled Automatic Safety Guard for Power Presses. This guard establishes a light screen between the operator and the press die set. When beam is broken the press is rendered inoperative. Guard is designed to operate on all small presses up to and including 45 power [illegible]sses. Installation instructions, service notes and schematic diagrams are given.

## SAFE PRACTICES

**Manual of Laboratory Safety** 13

Fisher Scientific Co.—34-page booklet presents extremely useful and interesting information on safe practices in chemical laboratories. In showing how to prevent accidents in the laboratory, these items are covered: storage risks, handling risks, faulty techniques, burns, toxic fumes, poisons, fires, explosions, and disposal risks. Booklet also shows safety and production equipment for use in chemical laboratories.

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